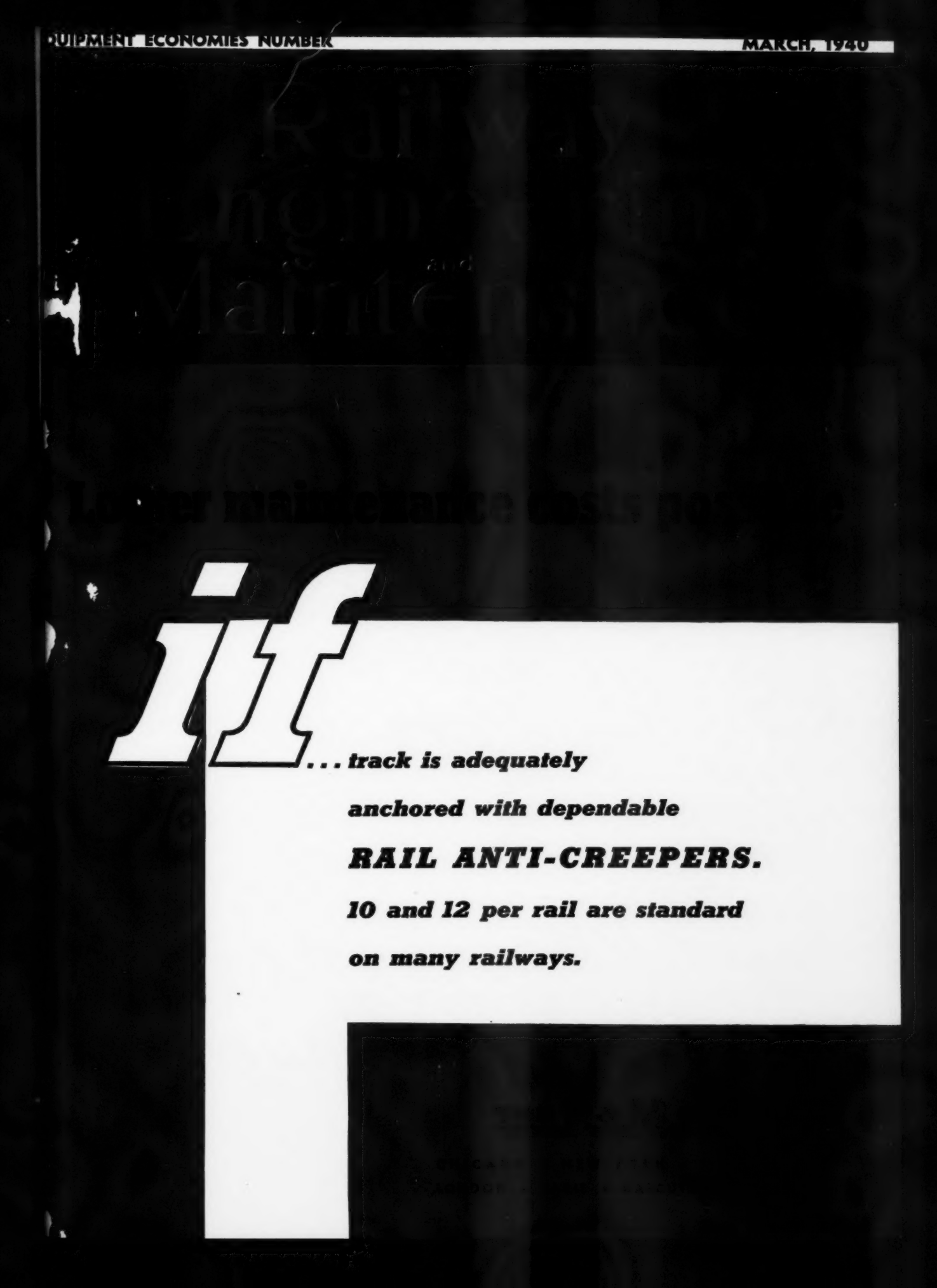


if

. . . track is adequately

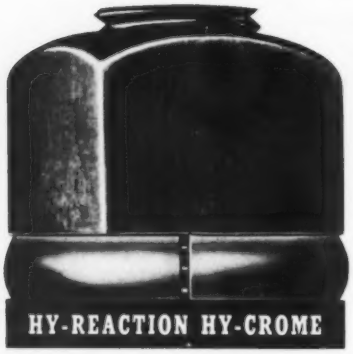
anchored with dependable

RAIL ANTI-CREEPERS.

10 and 12 per rail are standard

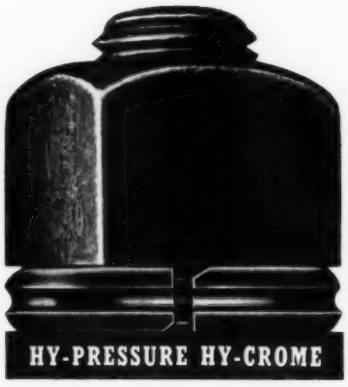
on many railways.

Reliance HY-CROME *Spring Washers*


HY-REACTION HY-CROME

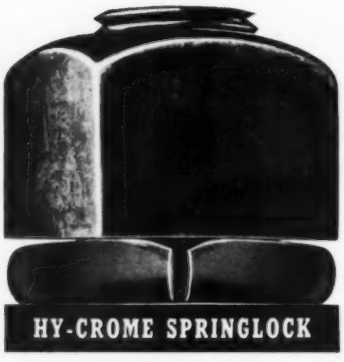
HY-CROME BOLT SECURITY

HY-CROME SPRING WASHERS provide the correct reactive tension over an adequate range of reaction from flat. Excessive or insufficient spring washer tension must be avoided as an improperly equipped assembly will not have bolt security.


HY-PRESSURE HY-CROME

HY-CROME BOLT EFFICIENCY

Basic principles of spring washer engineering are carefully followed in laboratory and field research test development of HY-CROME SPRING WASHERS for physical and functional qualities. Service stresses to which they are subjected are anticipated.


HY-CROME SPRINGLOCK

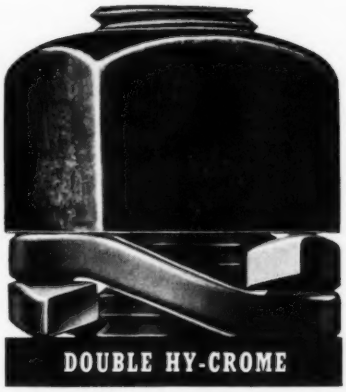
HY-CROME BOLT ECONOMY

Economical usage of spring washers is dependent principally upon how successfully the spring washers used meet actual service conditions. Excessive tension will freeze the assembly and insufficient tension is detrimental. Use scientifically made HY-CROME SPRING WASHERS and avoid this.

LOCOMOTIVE HY-CROME

HY-CROME PRODUCTS EXHIBITED

The American Railway Engineering Association Convention is in Chicago, March 11 to 14. At booth No. 31 in the N. R. A. A. exhibit at the International Amphitheatre, our Hy-Crome Spring Washer line will be represented and is of interest to Signal, Maintenance, Bridge and Building Engineers, Roadmasters and Purchasing Officers.


DOUBLE HY-CROME

EATON MANUFACTURING COMPANY

RELIANCE SPRING WASHER DIVISION

MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

A Positive Heavy-Duty Stand

BETHLEHEM
MODEL 53
SWITCH STAND
Operates on sliding-block principle. Positive when closed; ample leverage for heaviest points.
The alloy-steel sliding block can be rotated 90 degrees to give a new wearing surface.
Two types: Model 53-A stands 15-7/16 inches from tie to lamp tip; Model 53-B stands 7 feet 8-3/4 inches high.

...ideal for main-line service

Bethlehem Model 53 is one of the most powerful, most rugged switch stands built. Parallel-throw, with ample leverage for the heaviest points, it is positive in action and low in maintenance.

Action is of the sliding block type: Power is transmitted from the throwing lever to a hardened, alloy-steel block. This block slides in a grooved forged-steel spindle. As the lever and block move through a vertical arc, the spindle turns horizontally. A heat-treated screw-eye crank couples the spindle to the connecting rod, and permits adjustment of length of switch throw.

This type of throwing mechanism provides powerful leverage at the start and finish of the throw. Also, it is positive in action: with the switch closed in either position, the stand is on dead center and cannot be thrown by any thrust against the points.

Bethlehem Model 53 has only three moving parts. The sliding block, which bears the brunt of most wear, can be given a new wearing surface by turning it 90 degrees. All parts can be operated in an oil bath, since the base of the stand is designed as an oil reservoir.

Model 53 is available in two types: 53-A is a low stand, 15 7/16 inches from tie to lamp tip. 53-B is an intermediate stand, 7 feet, 8 3/4 inches high. Both have broad bases which make the stands unusually stable. Both have locking ears cast integral with the base.

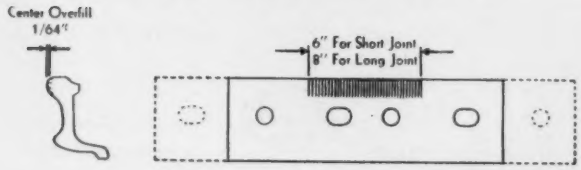
Many roads in several parts of the country have standardized on Model 53 switch stands for main-line switches. Their low maintenance makes them desirable for main-line service on any road.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

CENTER-OVERFILL ON HEADFREE JOINTS
AN IMPROVED FEATURE

FOR NEW RAIL



INCREASED LIFE due to

More accurate initial fit at center.

Greater depth of material at point of maximum wear.

Less wear as joint remains tighter.

LESS TENDENCY FOR RAIL END BATTER due to

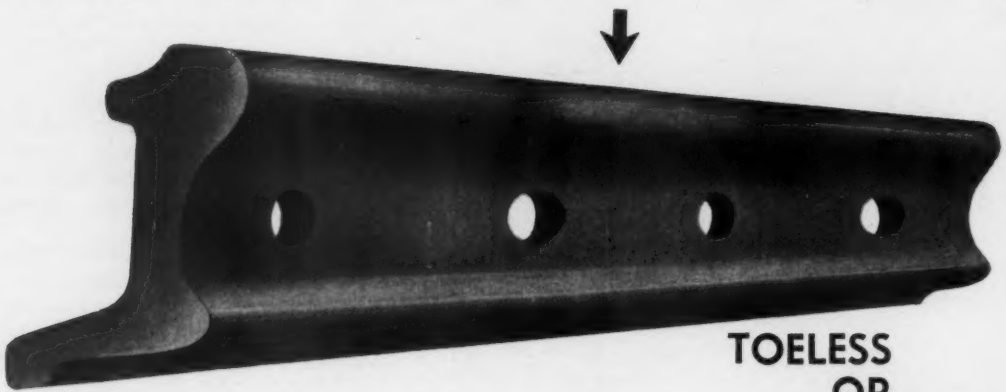
Sustained tightness of joint.

Retarded development of joint wear at center.

LESS MAINTENANCE REQUIRED due to

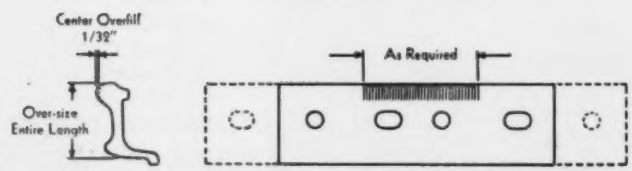
Positive contact at center.

Better sustained bolt tension.



TOELESS
OR
FLANGE

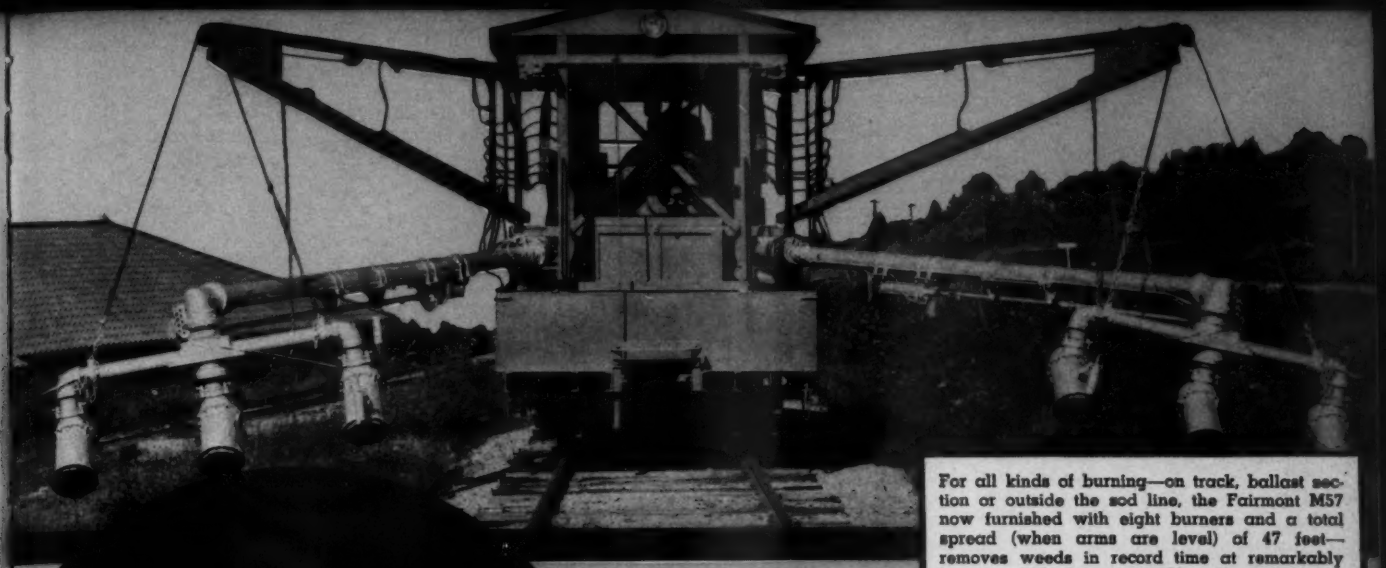
FOR WORN RAIL



OVERSIZE SUPPLIED TO SUIT WEAR CONDITIONS
WITH ADDITIONAL ADVANTAGES OF CENTER OVERFILL

THE RAIL JOINT COMPANY, INC.

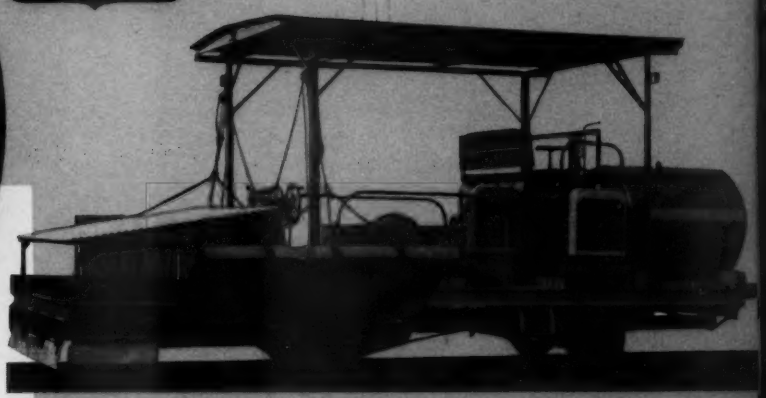
50 CHURCH STREET — NEW YORK, N. Y.



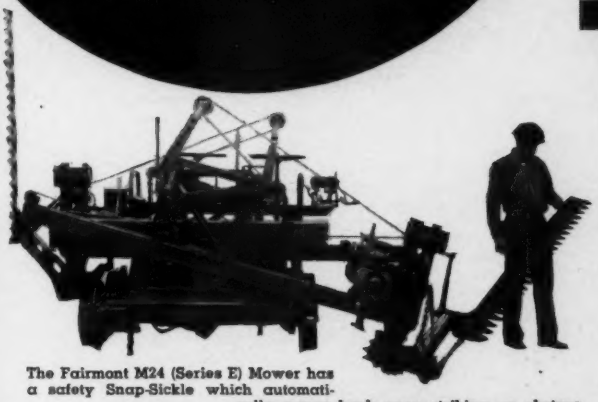
For all kinds of burning—on track, ballast section or outside the sod line, the Fairmont M57 now furnished with eight burners and a total spread (when arms are level) of 47 feet—removes weeds in record time at remarkably low cost. (Six burner machine illustrated.)

REMOVE WEEDS AT LOWER COST WITH Fairmont EQUIPMENT

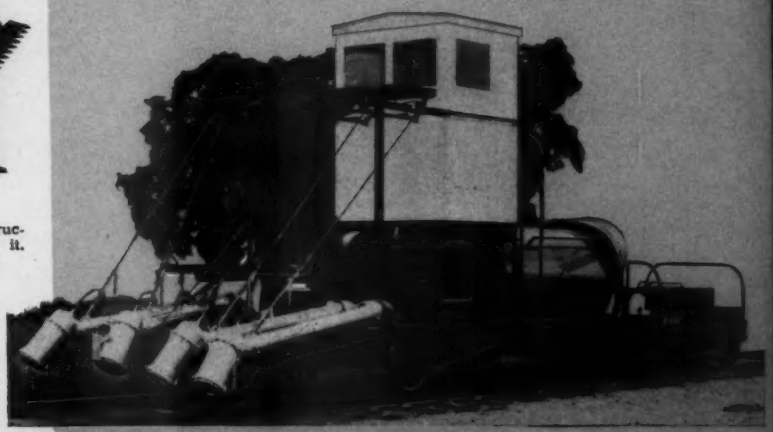
Performance ON THE JOB COUNTS



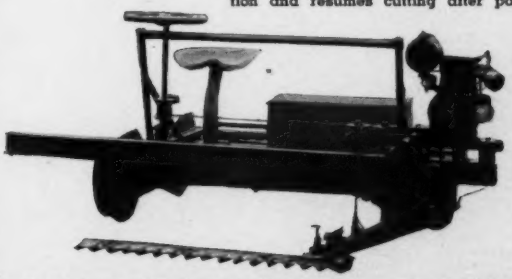
Where weed removal concerns principally the ballast section, the Fairmont M27 Oven-Type Burner is most economical. It is used by many roads for covering 500 mile sections of track repeatedly—and thus keeps the weeds down before they can get a good start. The M27 has a killing width of 18 feet and an improved shielding system that cooks the weeds and protects the operator from the heat.



The Fairmont M24 (Series E) Mower has a safety Snap-Sickle which automatically moves back upon striking an obstruction and resumes cutting after passing it.



For weed control on shorter runs, the Fairmont M44 with four burners can handle any type of work, burning track, ballast, or beyond the sod line. The burning width is 10 feet in one trip or 20 feet in two trips. The M44 includes a Fairmont propelling unit of 36 H. P.



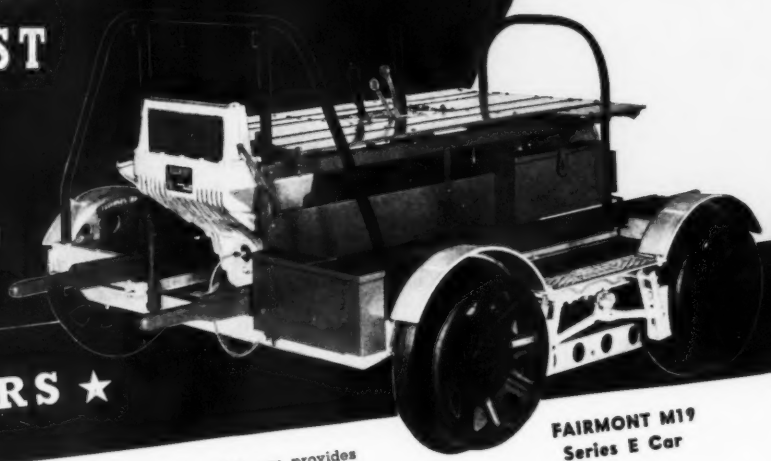
The Fairmont M54 (Series C) Weed Mower cuts weeds 9 feet from the center line of the track and between the rails. Rear lift 95 pounds. This machine is of simple construction, can be passed from section to section and can be pulled by a standard section car.

FAIRMONT RAILWAY MOTORS, Inc., Fairmont, Minn.

Fairmont

HAS THE RIGHT MOTOR CAR FOR EVERY HAULING JOB

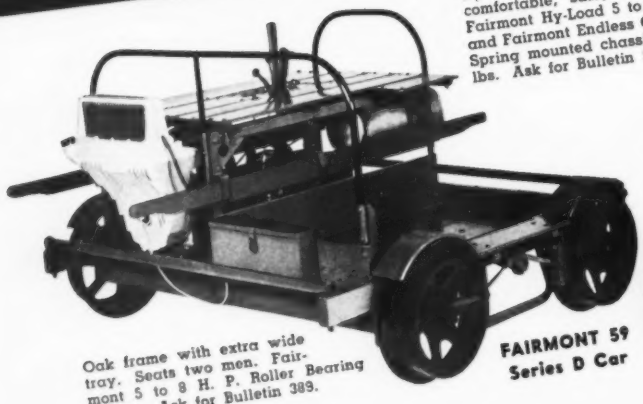
EACH LEADS IN THE FEATURES THAT SERVE YOU BEST



FAIRMONT M19
Series E Car

★ INSPECTION CARS ★

For one man or a crew of four, this car provides comfortable, safe, fast transportation at low cost. Fairmont Hy-Load 5 to 8 H. P. Roller Bearing Engine and Fairmont Endless Cord Belt Drive. Spring mounted chassis. Rear lift 95 lbs. Ask for Bulletin 396A.



Oak frame with extra wide tray. Seats two men. Fairmont 5 to 8 H. P. Roller Bearing Engine. Ask for Bulletin 389.

FAIRMONT 59
Series D Car

FAIRMONT M9
Series D Car

Two man inspection car. Fairmont 5 to 8 H. P. Roller Bearing Engine. Spring mounted chassis. Rear lift 95 pounds. Endless cord belt drive. Ask for Bulletin 391A.

★ OF ALL THE CARS IN SERVICE TODAY

★ SECTION CARS ★

FAIRMONT M14
Series G Car

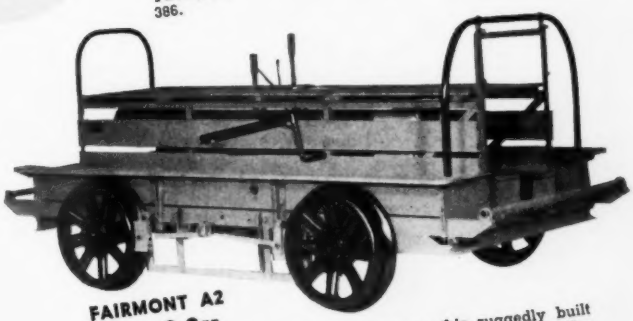
Here is equipment that can be used as an inspection car by two men in off seasons and as a section car with sufficient pulling capacity for all six-man section jobs. Powered by Fairmont 5 to 8 H. P. Hy-Load Roller Bearing Engine. Ask for Bulletin 397.

FAIRMONT S2
Series G Car

High drawbar pull at normal speeds makes this 10 man car ideal for heavy duty section service including the towing of trailers. Power plant—Fairmont's 8 to 13 H. P. Water-Cooled Roller Bearing Engine. Two-speed transmission available. Ask for Bulletin 386.

FAIRMONT S2
Series F Car

The Fairmont Hy-Load 8-13 H. P. Roller Bearing Engine in this car generates abundant power for pulling 12 ton loads on level track, yet the light weight (rear lift 145 lbs.) permits use with absolute safety by two men. Ask for Bulletin 394.



FAIRMONT A2
Series C Car

For the largest gangs and long sections, this ruggedly built unit with structural steel chassis, Fairmont 8 to 13 H. P. Roller Bearing Engine and Fairmont Hy-Drive Reduction Gear has plenty of room and power. Fully described in Bulletin 398.

★ GANG CARS ★

FAIRMONT A3
Series C Car

Mowers, burners and heavy supplies can be pulled with utmost economy by this B & B and Extra Gang Car. Four speeds forward or reverse, large tray capacity and broad speed range are only a few of its many advantages. See Bulletin 403.

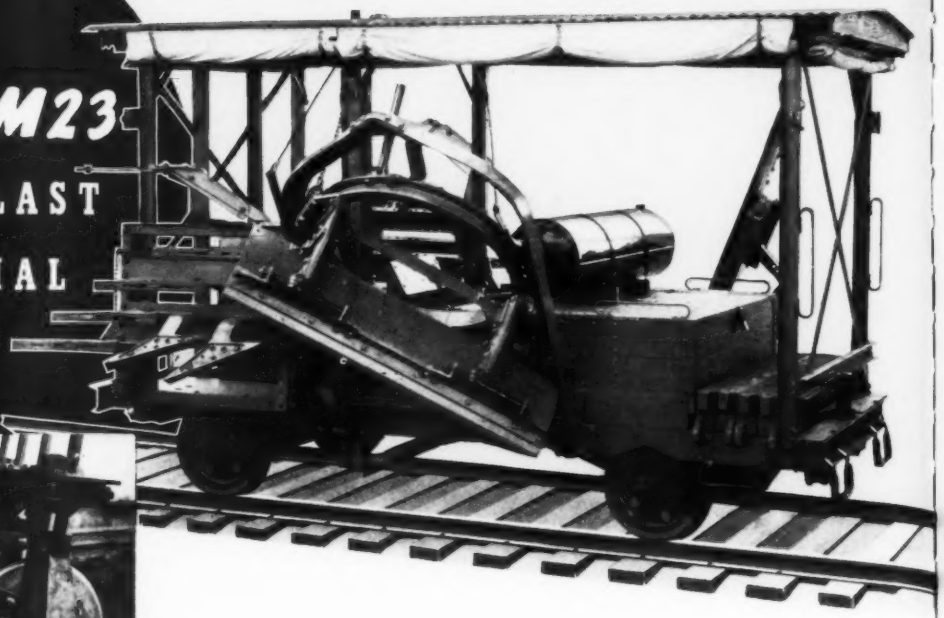
FAIRMONT A5
Series C Car

Here is a car that can pull 13 trailers loaded with 260 men at a speed of 30 miles per hour on level track. It is powered by a 4 cylinder 36 H. P. Waukesha engine and has four speeds forward or reverse with extremely high drawbar pull at each speed. See Bulletin 385A.

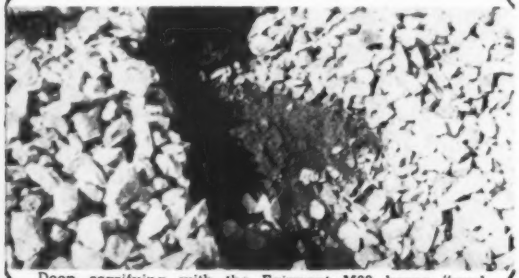
Performance ON THE JOB COUNTS

MORE THAN HALF ARE *Fairmonts* ★

THE Fairmont M23 SCARIFIES BALLAST AT SUBSTANTIAL SAVINGS



The Fairmont M23 Traction Unit operates various ballast tool "wings," for discing, blading and scarifying.



Deep scarifying with the Fairmont M23 keeps "mud stockings" off the tie ends and thus improves drainage, protecting the ties from damage.

Without regular and proper scarifying, the ballast holds water and dirt and cracks the ties as shown above.

Railroad maintenance of way engineers, in rapidly increasing numbers, are recognizing the importance of proper drainage for reducing track upkeep costs.

With the Fairmont M23 Ballast Drainage Car, rock shoulders can be scarified deep enough to assure brisk drainage and gravel, dirt or cinder shoulders can be disced and bladed for free drainage for maximum protection of the ties and roadbed.

The Fairmont M23 is powered by a Waukesha 6-cylinder 86 H. P. engine and has four forward speeds with normal reverse speed for backing short distances. A massive Fairmont reverse gear on the rear axle which can direct all four forward speeds backward, permits fast deadheading in either direction to quickly clear trains. Write for Bulletin 308B fully describing this economical equipment.

Performance ON THE JOB COUNTS

FAIRMONT RAILWAY MOTORS, Inc.

FAIRMONT, MINNESOTA, U. S. A.

Fairmont Railway Motors, Ltd., Toronto, Ont., Canada

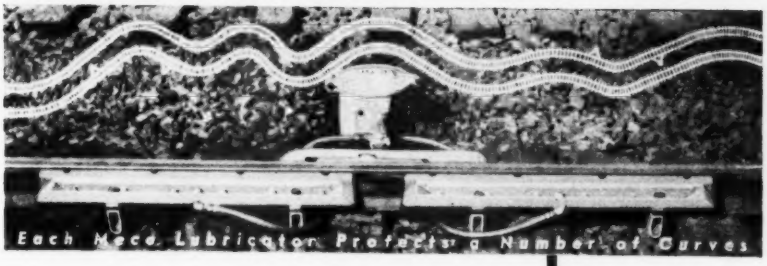
INSPECTION MOTOR CARS • SECTION MOTOR CARS • B&B AND EXTRA GANG CARS
PUSH CARS • TRAILERS • MOTOR CAR ENGINES • ROLLER AXLE BEARINGS
AXLES • WHEELS • BALLAST DRAINAGE CARS • BALLAST CLEANERS • MOWERS
WEED BURNERS • EXTINGUISHER CARS • PAINT SPRAY CARS • ELECTRIC POWER CARS

CUT DOWN THESE 3 HIGH SPOTS IN MAINTENANCE COST

1 Cut down high spot No. 1 in Maintenance cost with

MECO CURVE RAIL LUBRICATOR

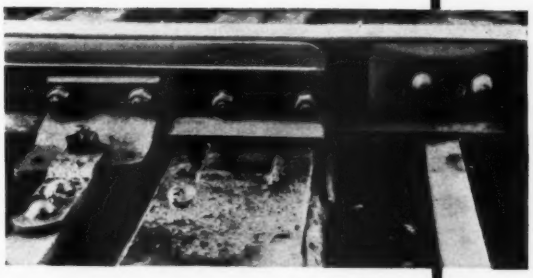
Eases wheels around curves and ends the necessity for frequent re-gauging and re-spiking—or replacement of curve rails before the tangents need re-laying. One Meco Lubricator usually gives protection to several curves.



2 Cut down high spot No. 2 with

MACK SWITCH POINT PROTECTORS

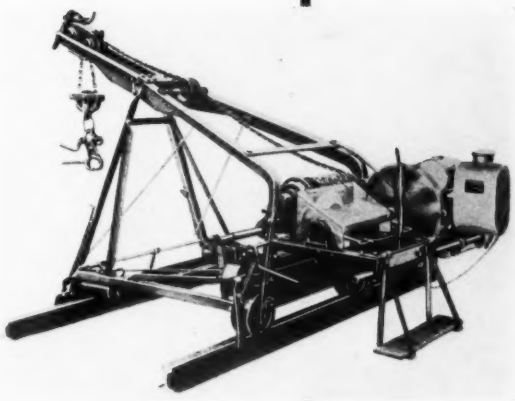
Reversible. After extending the ordinary life of the switch rail 4 or 5 times, the Mack Protector is reversed—and does it all over again!



3 Cut down high spot No. 3 with

POWER RAIL LAYER

It's moved along the track by the same 4 or 5 men who operate the rail hoist. It cuts rail handling costs on large gangs—is economical for use with small gangs.



WE CAN ONLY COVER THE HIGH SPOTS HERE IN THE SAVINGS WHICH THESE THREE DEVICES EFFECT. WRITE US FOR COMPLETE INFORMATION.

Visit our booths 49, 50, 63 and 64 at NRAA Exhibition

MAINTENANCE EQUIPMENT CO.

RAILWAY EXCHANGE BLDG. CHICAGO, ILLINOIS

Under the Ballast— the Ties—— the Rails——

THERE'S a method of concrete track support for every condition. Concrete spreads the load—reduces maintenance—makes smoother riding.

Write for booklet "Concrete Supported Railway Track."

PORTLAND CEMENT ASSOCIATION
Dept. 3-27, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work.

Canadian National fastens rails directly to concrete decks of scores of bridges.

FLUSH YOUR SUBGRADE TROUBLES

Out the Drain!

It can be done! For almost without exception you'll find that impounded water is the cause of faulty subgrades. With ARMCO Perforated Pipe you can eliminate these hidden trouble spots, save recurring maintenance expense and stabilize your roadbeds.

Installing a subdrainage system with ARMCO Perforated Pipe is a simple operation. When properly supervised, unskilled men can do the work without special equipment. And once installed, ARMCO Pipe provides a lasting cure for unstable subgrades.

The perforations are uniformly spaced along the entire pipe and designed to admit water freely, yet exclude backfill material. There is no danger of disjointing. Sturdy, efficient couplings, plus a flexible corrugated metal design, assure safe structural strength to withstand severe frost action or the impact and vibration of traffic. Beyond saving repair bills, ARMCO Perforated Pipe helps your roadbeds meet today's loading and high speed requirements. Write us for additional data and prices. Armco Railroad Sales Co., Incorporated, 801 Curtis St., Middletown, Ohio. Offices in principal cities.

★ ★ ★

Out the drain goes a trouble-maker! Once the water pouring from this line of ARMCO Perforated Pipe had saturated the subgrade under a long stretch of track on a curve approaching a bridge. Now continual maintenance has been eliminated and the roadbed stabilized for high speed traffic.

ARMCO PERFORATED PIPE

ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

From BABIES to LOCOMOTIVES!

7670-SA21.10

FROM the nursery to the roundhouse . . . from the prescription counter of the corner drug-store to the steel mill . . . there is hardly any type of weighing job for which Fairbanks Scales aren't built. Each can be depended upon for the sustained accuracy and long life that have made Fairbanks the greatest name in weighing.

Take Fairbanks Type "S" Railroad Track Scales for example. The first railroad track scale ever built was a Fairbanks Scale. Fairbanks Scales are still first along the right of way. To be first and *maintain* that leadership is evidence in itself of the kind of service that Fairbanks Scales have rendered the railroads.

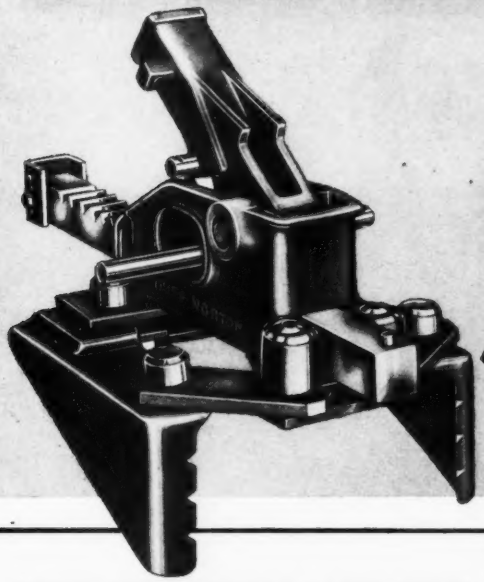
Fairbanks, Morse & Co., Department 88, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

FAIRBANKS-MORSE

The Greatest Name in Weighing

SCALES

CUT TRACK MAINTENANCE COSTS WITH THE NEW DUFF-NORTON TIE-PULLER



See this remarkable new product at the Duff-Norton Booths (Nos. 32 and 33) NRAA Exhibit

One Section Foreman who tried out a new Duff-Norton Tie-Puller on routine maintenance reports: "A tie-replacing job that ordinarily takes 80 hours was completed in 38 hours with the Duff-Norton Tie-Puller. The roadbed was not disturbed, and ties that otherwise would have been scrapped were turned and used again."

For your Track Maintenance, the new Duff-Norton Tie-Puller offers these advantages:

FASTER. Saves 50% in time required for tie renewals.

EASY TO USE. Track men quickly learn to use the Duff-Norton Tie-Puller—and like it!

CUTS COSTS. Makes the maintenance-of-way Budget go farther by (a) speeding tie renewals; (b) salvaging ties; (c) less roadbed disturbance.

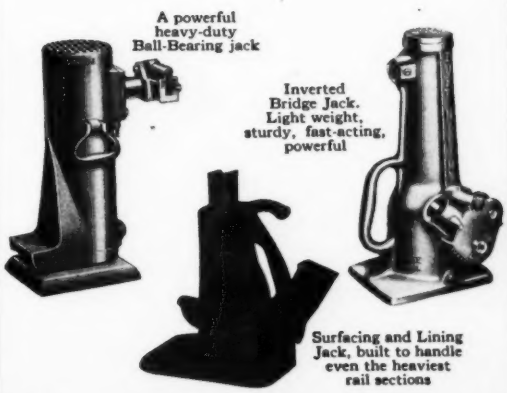
Send for bulletin giving full information about the Duff-Norton Tie-Puller, or write for a sample to try out on your road.

OTHER DUFF-NORTON JACKS THAT MAKE MAINTENANCE-OF-WAY EASIER . . .

The favorite of railroad men everywhere—the No. 117 Track Jack

Another popular Duff-Norton track jack—the double-acting No. 110

Every track crew needs the side lift Duff-Norton No. 304



A powerful heavy-duty Ball-Bearing jack

Inverted Bridge Jack. Light weight, sturdy, fast-acting, powerful

Surfacing and Lining Jack, built to handle even the heaviest rail sections

THE DUFF-NORTON MANUFACTURING COMPANY
PITTSBURGH, PA.

We want to cut our maintenance costs, and

- ☐ We would be interested in testing a Duff-Norton Tie-Puller
- ☐ Please send Leaflet describing Duff-Norton Tie-Puller
- ☐ Send information on the following Duff-Norton Track Jacks:

. . . . . .

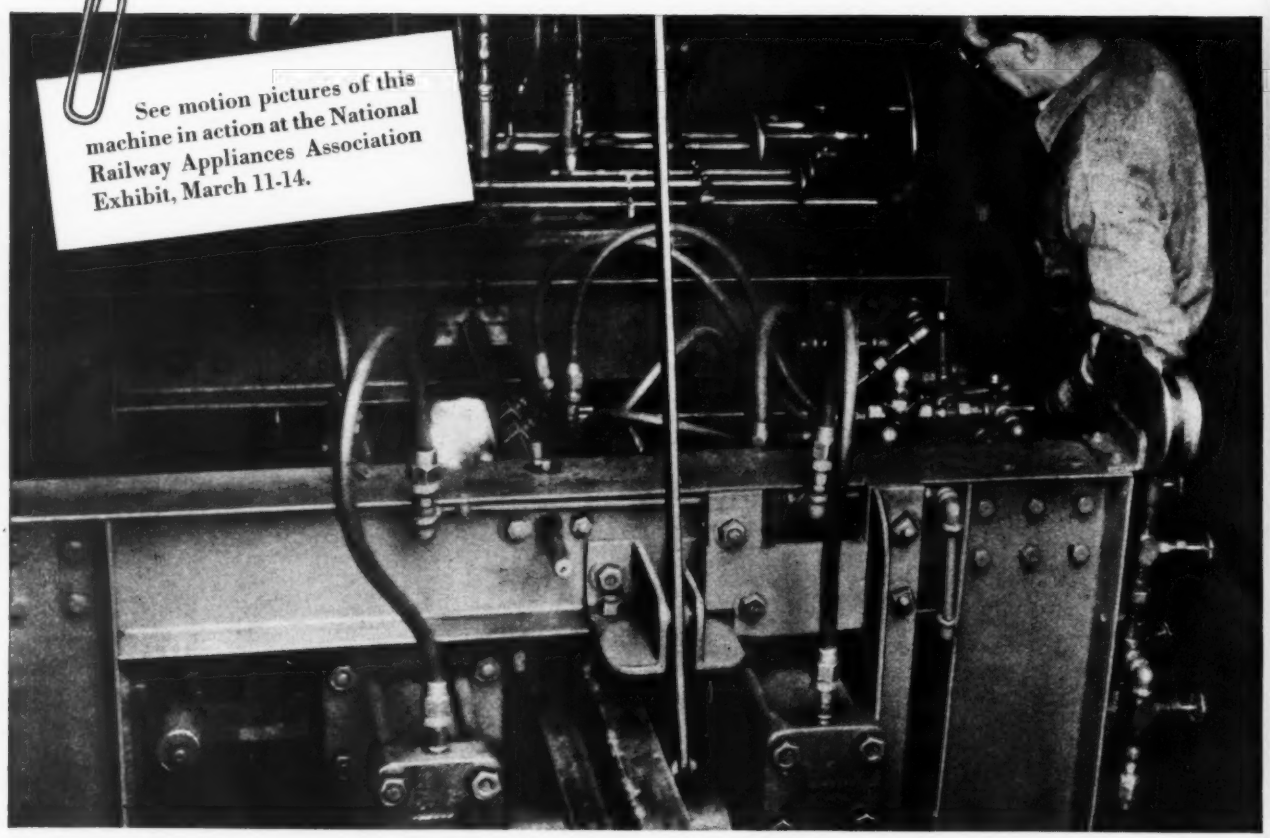
Name . . . . . Position . . . . .

Company . . . . . .

Address . . . . . .

Maintenance Costs

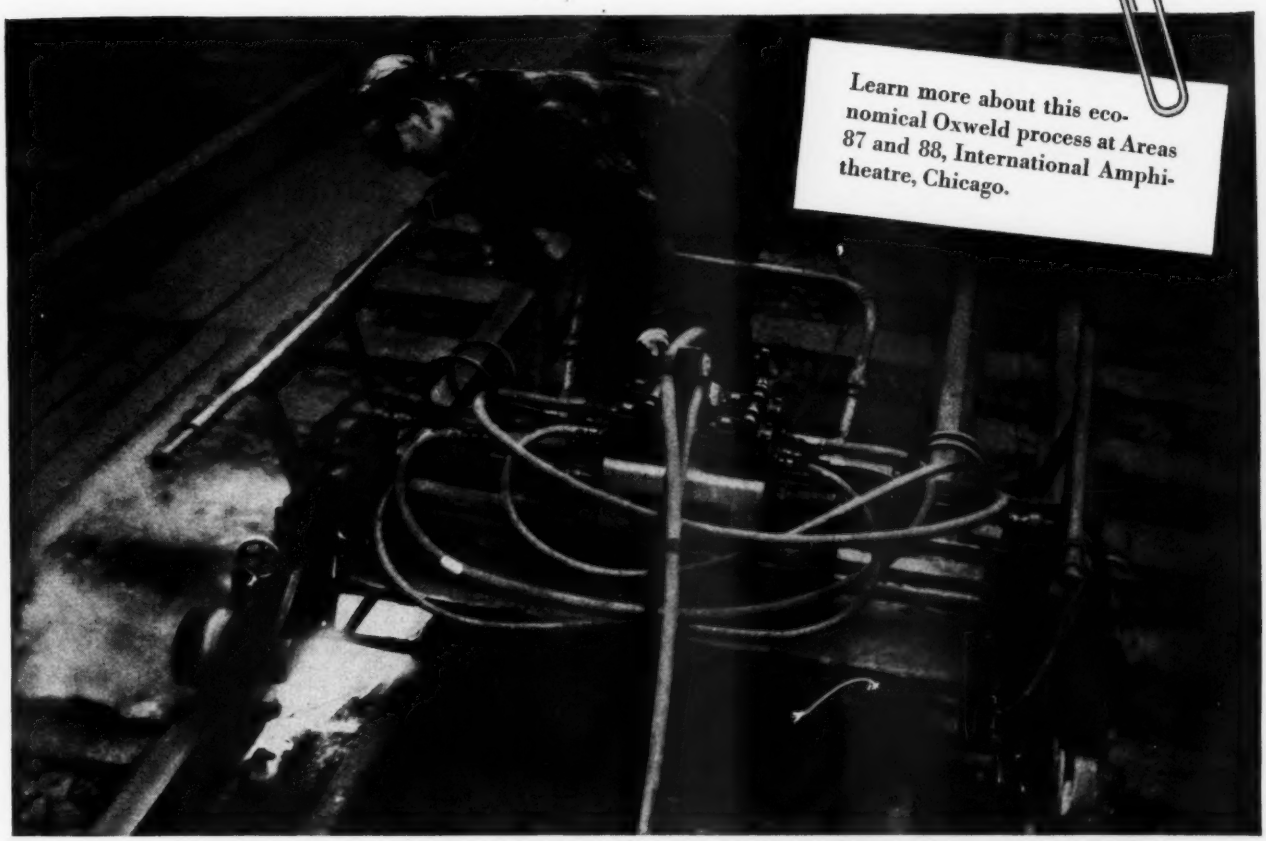
with These and Other Proved



CONTINUOUS WELDED RAIL—The Oxweld pressure butt-welding method is being widely used. Butt-welded rail installed on open deck bridges greatly reduces impact. Used in road crossings and station platforms, it avoids tearing up pavement to repair rail joints. It completely eliminates joint maintenance in tunnels and other installations.

can be Reduced

OXWELD DEVELOPMENTS



END-HARDENED RAIL—Laying of new rail with hardened ends is now standard practice for most railroads. The Oxweld method of end-hardening rail produces long-lasting results. A uniform, batter-resistant hardness is obtained in track at low cost. This method effects substantial reductions in joint maintenance.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

Carbide and Carbon Building UCC Chicago and New York

The word "Oxweld" is a registered trade-mark of a Unit of Union Carbide and Carbon Corporation

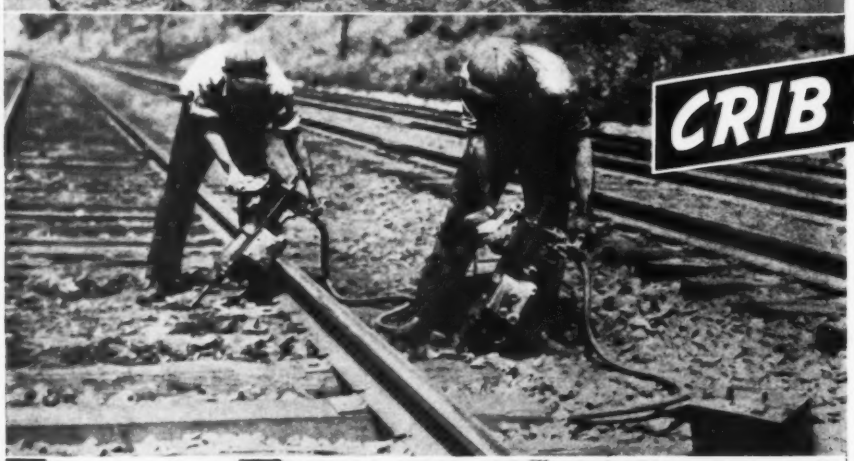
SERVICE FOR AMERICAN RAILROADS

FOR YEAR AROUND BARCO

USE THEM FOR

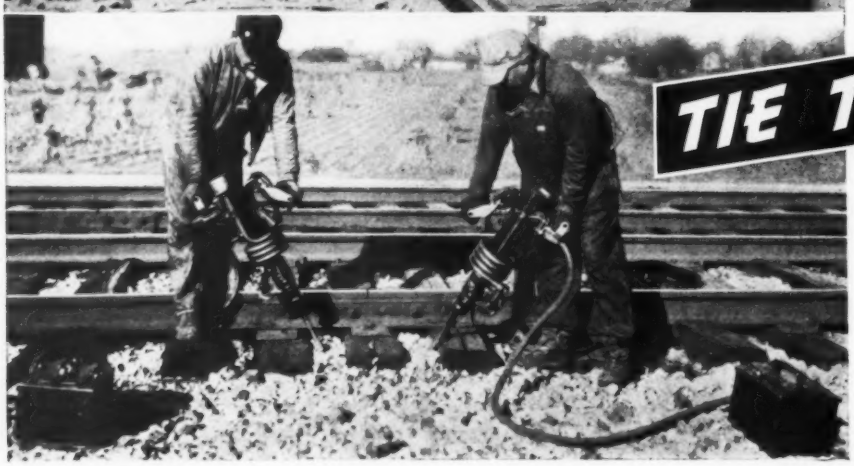
ICE BREAKING

One BARCO tytamper will break up all of the ice four men can remove.



CRIB BUSTING

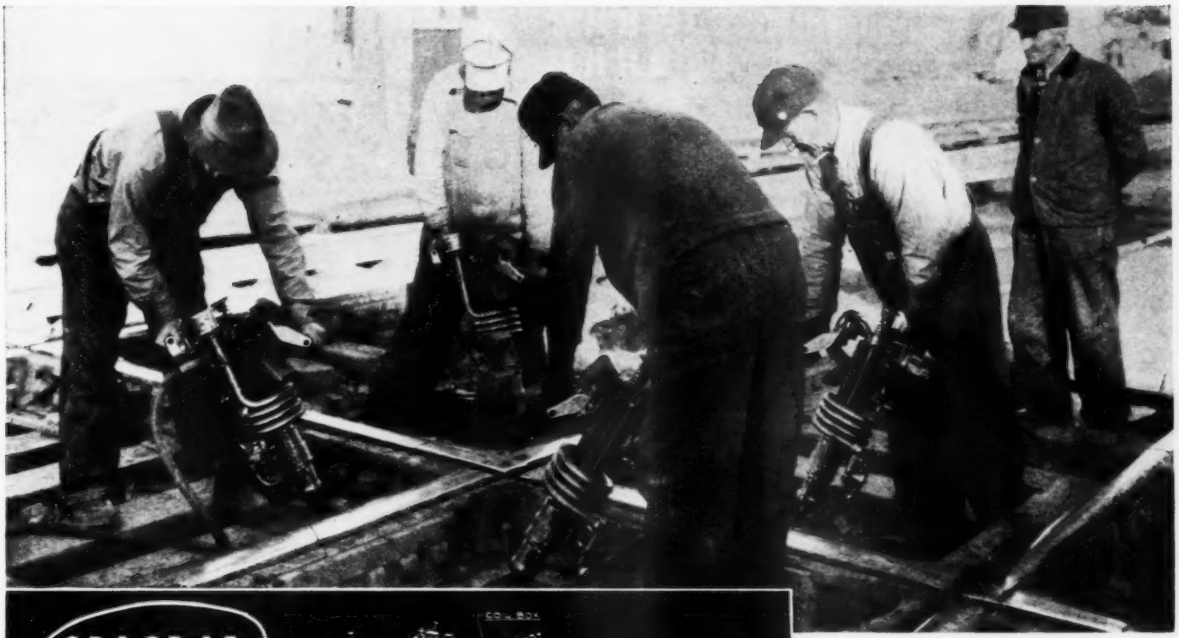
BARCO tytampers loosen cemented or frozen ballast quickly and easily.

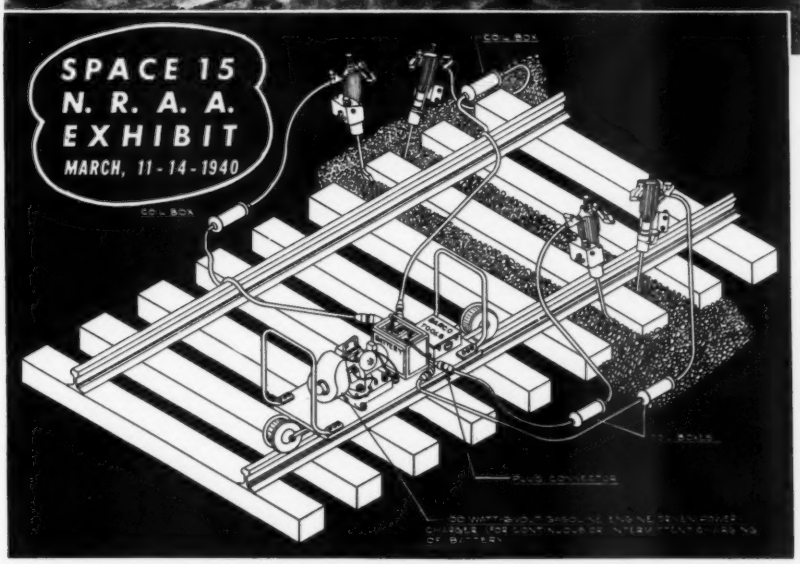


TIE TAMPING

On 55 Railroads — 4 years' satisfactory service.

Utility—
UNIT TYTAMPERS





Can also be operated from a portable Central Power Plant in units of 4, 8, 12, 16 or 20. One 6 volt wet battery with a 100 watt 6 volt gasoline operated charger weighing 46 lbs. will operate any number up to 12—slightly larger charger required for 16 or 20.

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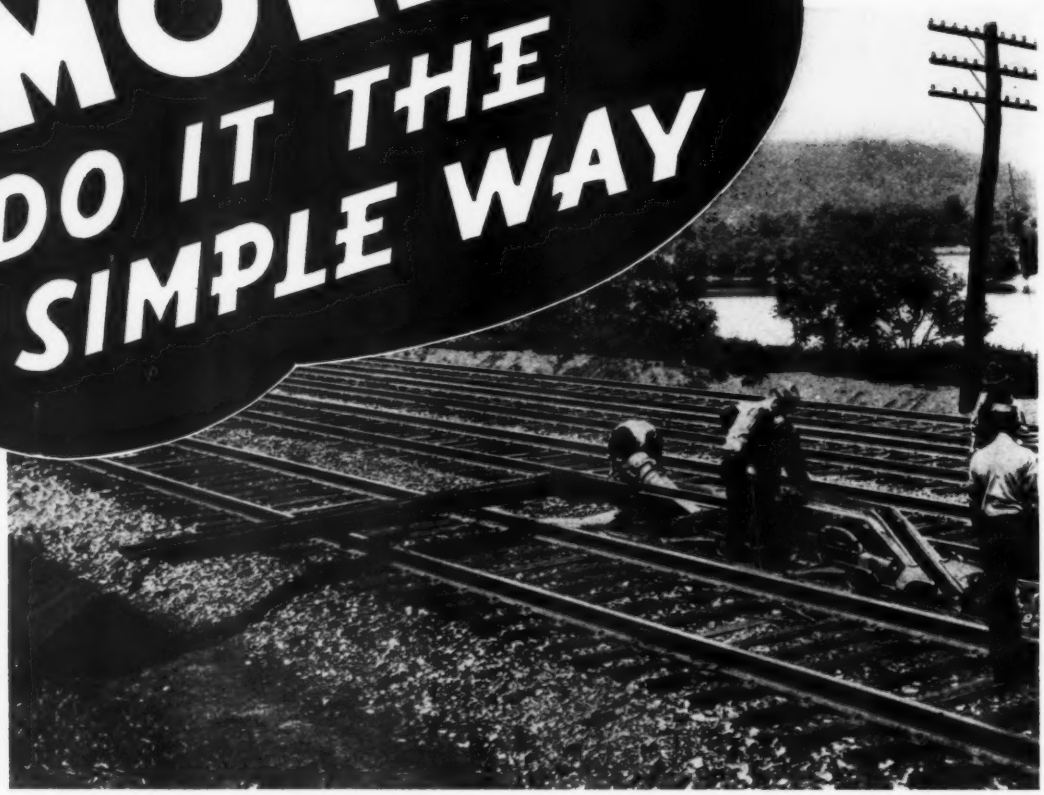
BARCO

MOLES DO IT THE SIMPLE WAY

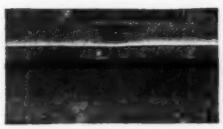
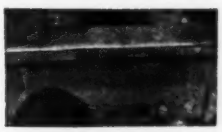


- **Reduce Track Maintenance Expense**
- **Speed up the Work**
- **Improve Ballast Drainage**
- **Provide a More Stable Roadbed**
- **Avoid Interference with Traffic**

by Using the MOLE for Cleaning Ballast on Your Important Tracks

RAILWAY MAINTENANCE CORPORATION
Pittsburgh, Pa.

TRACK lasts longer

when wheel-burned spots like this  are easily restored to true riding surface  by AIRCO oxyacetylene welding

Many thousands of wheel-burned spots have been successfully built-up by this proved Airco process. *There has not been a single failure.* Thus many rails which would otherwise have been removed, are still giving satisfactory service.

Simple, economical, quickly applied. That's the story of Airco Oxyacetylene Welding, briefly told. It is the best known way to keep track in first-class riding condition. Airco representatives in Booths 10 and 11, National Railway Appliance Exhibition, will welcome an opportunity to discuss with you applications of the oxyacetylene flame in maintenance-of-way work. Ask them about flame cleaning and dehydrating steel.

AIR REDUCTION

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DISTRICT OFFICES IN PRINCIPAL CITIES

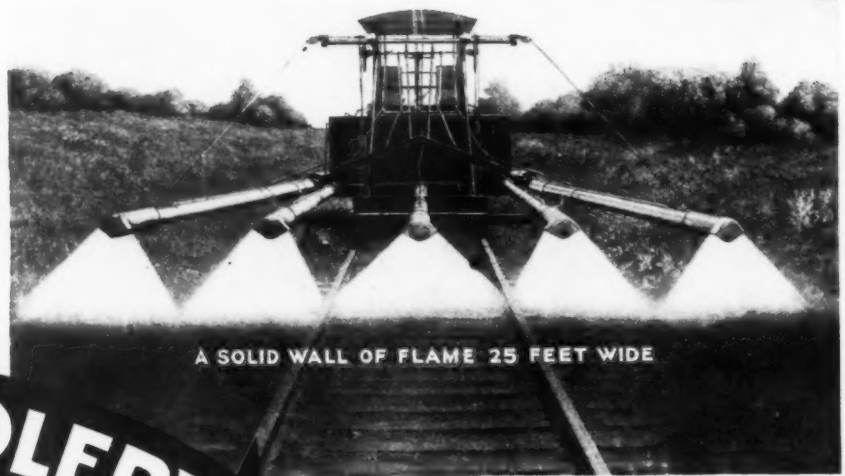
● SERVING RAILROADS FROM COAST TO COAST ●

NOW IS THE TIME

TO FACE THE PROBLEM OF NEXT SUMMER'S WEEDS

DESTROY WEEDS

- to improve appearance
- to prevent fouling of ballast
- to facilitate drainage
- to retard decay of ties
- to facilitate tie and track inspection
- to stimulate employee morale



WOOLERY WEED BURNERS

DESTROY THEM *the Economical Way*

It is widely agreed that the most economical way to eradicate weeds is to burn them.

Cost records of railroads using WOOLERY Weed Burners prove that they provide the least expensive method with maximum safety, speed and flexibility.

The two-burner MIDGET OCTOPUS is ideal for short line railroads, and for work around yards and terminals. The three-burner and five burner GIANT OCTOPUS models, with additional spread of weed destroying fire, are indispensible to maximum efficiency in main-line roadbed work. These three models assure complete destruction of all vegetation over the area burned because they *concentrate* the flames upon the proper area.

Write for complete information on WOOLERY Weed Burners . . . they are contributing to *greater economy* on railroads throughout the world.

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS

WHY Struggle TO REMOVE A TIE INTACT

WHEN YOU ARE GOING TO BURN IT ANYWAY?

Eliminate the necessity for removing it whole when, by cutting it in three pieces, it can be removed with minimum effort by one man.

The WOOLERY TIE CUTTER

reduces tie renewal costs 30%—saves 12 cents or more on every tie renewed—eliminates the necessity for digging out the adjacent crib—removes the temptation to renew a tie having a year or more of service life remaining—avoids disturbance of the compacted bed on which the old tie rested, and completes your program weeks ahead of schedule. Savings effected by WOOLERY Tie Cutters are not theoretical—they represent actual cash—as proved in the renewal of over 1,000,000 ties last year.

INVESTIGATE NOW—Send for 12-page Booklet—Let us demonstrate on your road.

WOOLERY MACHINE COMPANY

MINNEAPOLIS Pioneer Manufacturers of MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

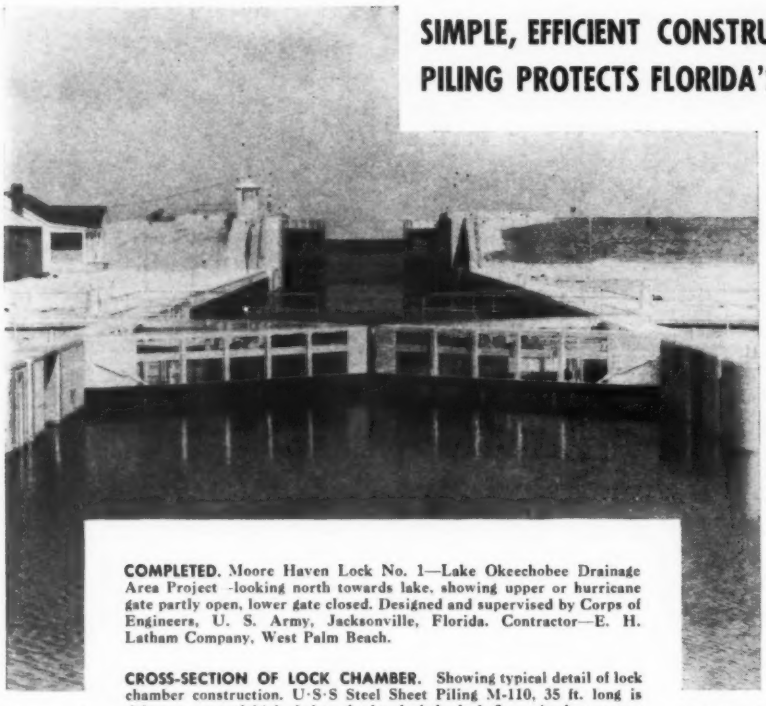
TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS

Sturdy Walls of Steel

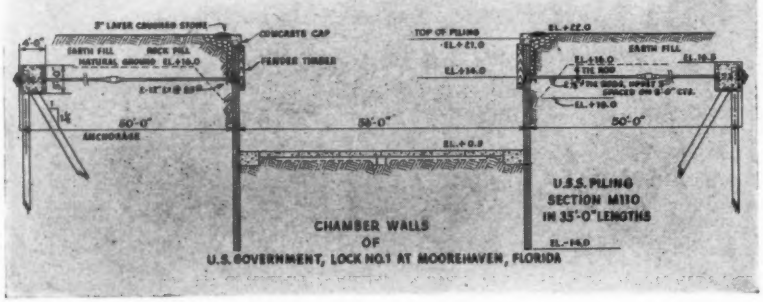
safeguard this Lake Okeechobee Lock

SIMPLE, EFFICIENT CONSTRUCTION WITH U·S·S STEEL SHEET PILING PROTECTS FLORIDA'S CROSS-COUNTRY WATERWAY



COMPLETED. Moore Haven Lock No. 1—Lake Okeechobee Drainage Area Project -looking north towards lake, showing upper or hurricane gate partly open, lower gate closed. Designed and supervised by Corps of Engineers, U. S. Army, Jacksonville, Florida. Contractor—E. H. Latham Company, West Palm Beach.

CROSS-SECTION OF LOCK CHAMBER. Showing typical detail of lock chamber construction. U·S·S Steel Sheet Piling M-110, 35 ft. long is driven to extend 14 ft. below the level of the lock floor. Anchor system consists of 2⅛" tie rods, 50 ft. long, placed on the waterline, set on 8 ft. centers, and anchored to wooden anchor and batter piles, the upper ends of which are set in a 4' x 5' reinforced concrete cap as shown. In the lock chamber 12" x 12" fender timbers protect the face of the steel sheet piling.



THE Moore Haven Lock No. 1 on the Caloosahatchee River, Florida, is an important part of the U. S. Government project for providing a navigation channel at least 6 ft. deep and 80 ft. wide from the Atlantic Ocean to the Gulf of Mexico at Fort Meyers.

In this control structure, a combined hurricane gate and lock, the lock chamber proper is 50 ft. wide and 250 ft. long. To simplify the construction of the lock chamber and cut-off walls, some 800 tons of U·S·S Steel Sheet Piling were used; Section M-110, 35 feet long, in the lock walls and Section M-115, 20 feet long, in cut-off walls.

U·S·S Steel Sheet Piling was used here for the same good reasons that have led to its selection in so many other Florida projects and elsewhere —great strength, long life, low cost of installation, low expense for maintenance. Assembled in small units, it forms a wall that is water-tight and *continuous*—a sturdy barrier, strong to keep water in its place, free from marine borer attack and attractive in appearance as well.

Available in straight-web, arch-web and in the new "Z" sections, U·S·S Steel Sheet Piling is a rugged, lasting product. A *finished* product as shipped — ready to be handled and driven under the most difficult conditions of soil, water and surf. In breakwaters, bulkheads, seawalls, revetments, jetties, and groins, it provides ideal and economical protection against waves and tempest, against drifting and abrading sand. We welcome the opportunity of discussing its possibilities with you.

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UNITED STATES STEEL

THE *Combination* THAT CUTS THE COST OF TRACK MAINTENANCE

CP Two-Stage Air-Cooled Portable Compressors are available in capacities from 60 to 315 cu. ft. per min.; Crawler Type; flanged wheel mounted (self-propelled or non-self-propelled); gasoline or Diesel-Driven. Economical in performance and low in maintenance costs, CP Compressors are the choice of many leading roads. » » » CP 3-D Tie Tamper, noted for its low air consumption, is ideal for "nipping". It is excellent on small rises and for tamping where the track is raised several inches.

See the CP Exhibit at the American Railway Engineering Association Convention, or write for SP 1943, "CP Equipment for Maintenance of Way".

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CP EQUIPMENT FOR MAINTENANCE OF WAY

MILES OF SMILES FOR THE Track Gang

Timken Bearing Equipped section motor cars and trailers make the lot of track maintenance crews, foremen and superintendents, happier by making their work easier and costs lower.

The same important advantages TIMKEN Roller Bearings give to modern locomotives, cars and streamlined trains are found in section cars equipped with TIMKEN Bearings. These include higher speed potential, simpler lubrication, less upkeep attention, and increased availability for service. Thus, miles of track maintenance become Miles of Smiles for everyone concerned. Make sure your new section cars roll on TIMKEN Roller Bearings.

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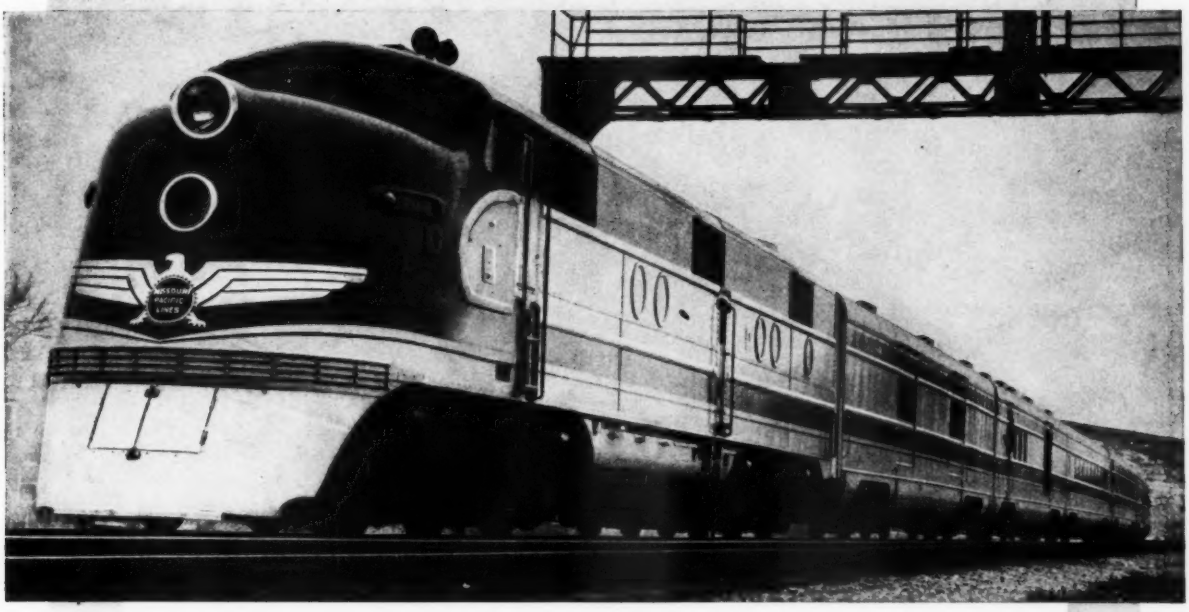
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



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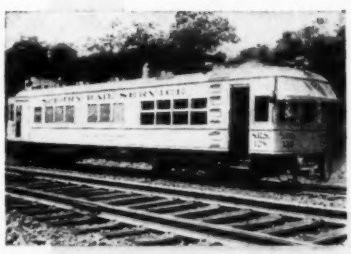
has used the

Progressively Improved Detector Cars of Sperry Rail Service For Testing Rails in Track Continuously since May, 1931

—thus Assuring Maximum Safety

by employment of the

Most Efficient Fissure Detecting Equipment



88,000 Track Miles Tested, to Date, on the Missouri Pacific System

SPERRY RAIL SERVICE • HOBOKEN, N. J. • CHICAGO, ILL.

No. 135 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

March 1, 1940

Subject: A Work Equipment Issue

Dear Reader:

Why are you giving so much space to work equipment? You are devoting almost your entire March issue to this one subject. Is that an accurate reflection of your readers' interest? Anticipating that these questions may occur to some of you as you study this issue, I shall answer them.

My answer is that the full and intelligent use of work equipment is the most important subject confronting maintenance officers today. It was important when we first set aside our March issue for the discussion of this subject more than 20 years ago when the use of mechanical equipment was in its infancy. It is vastly more important today when the use of this equipment has expanded so greatly.

This subject is important because the railways have invested more than $100,000,000 in work equipment during the last quarter century; they spent more than $6,000,000 for its purchase last year; their expenditures will exceed that amount this year. Yet in many respects this development is still in its infancy.

This subject is important because the use of this equipment is bringing about a revolution in the methods of doing work, a revolution made necessary to utilize most fully the benefits of these machines. It is important likewise from the improvement that it is bringing about in the working conditions of the men - not only removing most of the drudgery from their operations but raising their labor to a definitely higher plane.

It is important also to the railways in these days when they are pressed on all sides to meet the lower costs of other transportation agencies, for it provides the way by which they may maintain their tracks and structures to the higher standards required by today's speeds and traffic with the limited funds that are available.

It is true that we discuss work equipment and its uses to some extent in practically every issue throughout the year; yet by giving added space to this subject in this issue, we throw the spotlight on work equipment in a way that gives added emphasis – and this at the season of the year when maintenance officers are developing their working programs and are most receptive to information regarding the aids that are available to them.

It is for these reasons that, year after year for more than 20 years, we have devoted our March issue to this subject. By this action we have reason to believe that we have contributed to the acceptance of work equipment as a definite aid in maintenance of way activities and have had a part in raising the efficiency with which the railways conduct these operations – and in improving also the working conditions for maintenance of way labor. This is our answer to the questions raised at the beginning of the letter.

Yours sincerely,

Elmer T. Howson

ETH:KR

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Welcomed by economy-wise railroad maintenance superintendents everywhere as the ideal solution to true permanence in tie and timber installation, Giant Grip Dowels and Double Grip Spikes are making possible the saving of thousands of dollars in future maintenance costs.

On sheer merit alone they have proved their ability to solve one of the big problems of railroad maintenance, and as a result of actual service tests, now have the full approval of many of the country's leading railroads.

Write for new, descriptive booklet!

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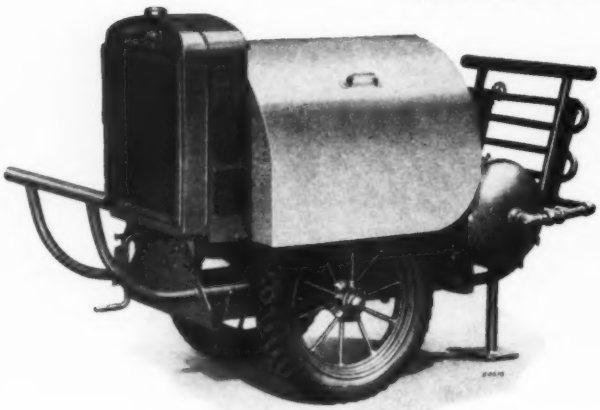
"OFF-TRACK" COMPRESSORS

No Traffic Interference—More Work Done

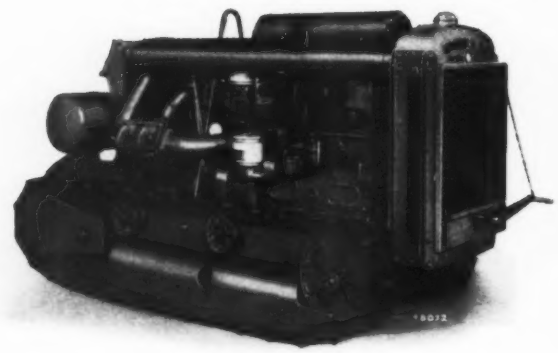
THE SPOT TAMPER



Being light in weight the Spot Tamper can easily be rolled along on the shoulder of the track. Illustration shows gang spot tamping.

This small, lightweight, compressed air outfit is ideal for tamping-up low spots in track and for other light work on track or bridges and buildings. It will operate four MT-3 low-air consumption tie tampers and a wide variety of other pneumatic tools, such as spike drivers, rail drills, wrenches, and riveters.

THE CRAWL-AIR



A Model 105 Crawl-Air Compressor supplying air for 8 MT-3 Tie Tampers on resurfacing work.

While larger than the Spot Tamper, the Crawl-Air is equally flexible, being equipped with air-motor-driven crawler treads. In no way does it interfere with traffic, being easily operated along the shoulder or right of way. 8, 12, or 16 MT-3 tie tampers can be operated respectively by the Models 105, 160 and 210. It is also widely used for operating the numerous other rail laying and bridge and building tools.

For more complete information on the Spot Tamper and Crawl-Air ask for a copy of our new form 2230-B.

See the Ingersoll-Rand Track Equipment Exhibit—International Amphitheatre, Chicago—March 11th to 14th incl. Booth No.'s 134, 135 and 136 (North Wing)

Atlanta, Birmingham, Boston, Buffalo, Butte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Duluth, El Paso, Hartford, Houston, Kansas City, Knoxville, Los Angeles, Newark, New York, Philadelphia, Picher, Pittsburgh, Pottsville, Salt Lake City, San Francisco, Scranton, Seattle, St. Louis, Tulsa, Washington

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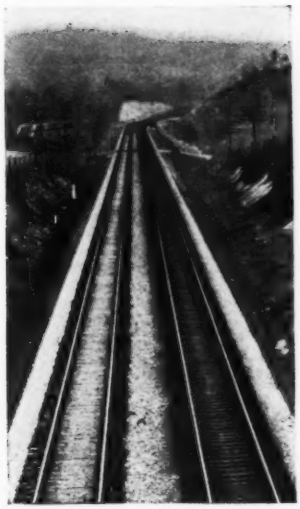

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NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1940

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ELMER T. HOWSON
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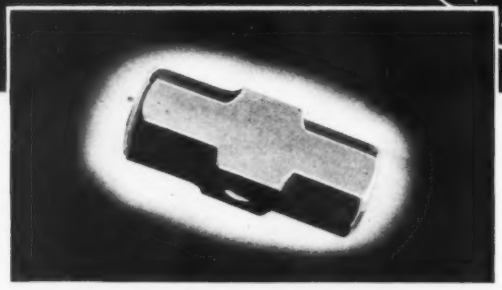
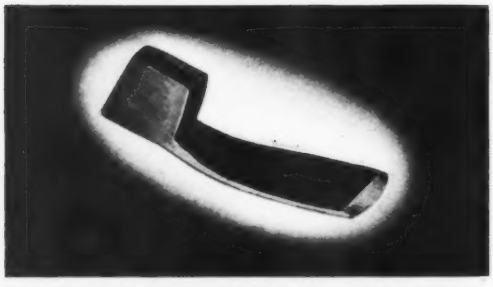
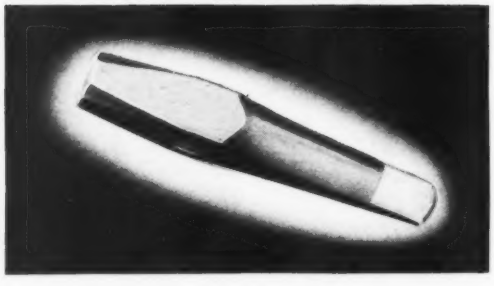
FOR SAFETY *and* ECONOMY

use Devil TOOLS







THE MANY thousands of Devil Tools used by railways came from orders that were repeated time after time, year after year. Blows of these tools are heard on maintenance work all over the nation—constant reminders of their safety and economy.

Forged from electric furnace alloy steels, Devil Tools have sharp, durable, heat treated cutting edges and precision formed, tough, tempered striking faces that have set the highest performance records.

Each tool requires a special alloy steel analysis and special manufacturing methods to develop longest life and best work results on the particular type of job for which it is designed. Thus, every Devil Tool is a special tool for a special purpose, the result of long tool-making experience.

WARREN TOOL CORPORATION
WARREN, OHIO

Railway Engineering and Maintenance

The Railroads

Can Meet the Demands

ARE the railways prepared and able to meet the needs of industry as these needs may expand with the recovery of business? Or are they decadent, with little resiliency to meet changing conditions?

These questions have been put to railway employees with increasing frequency in recent years as the advocates of waterway and highway transport have become more bold in their assertions that the railways alone are no longer able to meet the transportation needs of the country. And they have been joined in their attacts by the advocates of government operation of the railways who have been stirred by the hope that somehow in the confusion, private ownership and operation may be dethroned. These questions are of vital concern to every railway employee; they are of scarcely less concern to the public at large. They deserve an intelligent answer. To provide such an answer let us review developments of the last quarter century.

A Little History

In the year 1916, the railways handled the heaviest traffic in their history up to that time. In April, 1917, the United States entered the World War and the demands on the railways changed widely in intensity and character. In that year, they handled nearly 9 per cent more freight traffic than in the previous year, their record year, in spite of the serious handicaps of war priorities, congestion at ports and inability to get cars unloaded and released, etc.

In the closing days of that year the government took over the operation of the railways and in the next year the increase in traffic handled was less than 3 per cent —although expenses rose more than 50 per cent. In the following year, the second year of government operation, freight traffic fell back to the volume of 1916. In other words, the railways handled 9 per cent more traffic under private operation in the war year of 1917, than they did under government operation in the peace year of 1919—and did it with 180,000 fewer employees.

The railways were returned to private operation in 1920 and three years later they initiated a program of rehabilitation, reconstruction and expansion of facilities that removed all danger of lack of capacity, evidence of which is the complete absence of car shortages in the last seventeen years in the face of a traffic that in eight consecutive years exceeded that of the peak war year of 1918 by 1¼ to 8½ million cars annually. The efficiency in transportation movement that resulted from this improvement program is shown by the fact that the record traffic of 1929—involving the handling of more than eight million more cars than in 1918, was actually handled with 60,000 fewer cars and 5,600 fewer locomotives than in 1918. Furthermore, it is estimated that, by reason of the continuing increase in efficiency, this same traffic could be handled today with 350,000 fewer cars than were employed in 1918.

Courageous Investment

These great gains in efficiency have been made possible by the investment of large sums for improved roadway and equipment. This investment averaged $842,700,000 a year for the eight years 1923-1930; even during the depression years of 1931-8 it averaged $258,000,000 a year. This money has gone for a wide variety of purposes, including heavier rail, better ballast, improved drainage, heavier bridges, modernizing terminals, reducing curvature and grades and other roadway betterments, as well as for equipment. As a result of these heavy expenditures, the output of transportation per train, measured by tons moved one mile per hour, has risen 120 per cent since 1920.

Supplementing these physical improvements, the roads have devised numerous measures to increase the efficiency with which the facilities are used. Notable among these is the organization of thirteen regional advisory boards to foster shipper co-operation with the railways. Another is the formulation of a permit and embargo system to insure the prompt unloading and release of cars at destination.

Through these various measures, the railways have prepared to meet the needs of the country. That they have been successful in as acute a crisis as that which developed last fall constitutes proof that their work has been well done. This performance was well summarized by W. M. Clement, president of the Pennsylvania, in his annual report to his stockholders for the year 1939, which has just been made public.

Quoting from this report, "During the last four months of 1939, industrial activity scored one of the sharpest upturns in history. The railroads took it all in their stride. They went smoothly and successfully from gen-

erally poor business in August to relatively good business in October—from about 650,000 carloads a week to over 860,000 a week. That in itself was an accomplishment. To do it without congestion or delay was notable. It speaks well for the railroads—for this railroad and everyone connected with it.

"Never before were the railroads so abruptly faced with such swiftly mounting traffic requirements, and never before did they so decisively demonstrate their capacity and ability under private management to meet successfully and completely any demands that may be made upon them.

"The railroads are the backbone of the transportation industry of our country and retain their place of leadership because they provide the most advantageous and useful combination of safety, speed, comfort, regularity, frequency and low cost of service offered by any public carrier, together with the ability to operate practically without regard to weather conditions.

"Patrons are now receiving more for their transportation dollar than ever before."

The Answer

This is the answer of the railways to the questions raised at the beginning of this editorial. It is an answer of which every railway employee may be proud. It is an answer which they should be prepared to give to every questioner, in order that every citizen may gain a true conception of the place that the railways hold and are prepared to hold in our economic and industrial life.

Gaging New Rail

Line and Gage Track Ahead of Relaying

ONE of the questions that arise perennially and which will assume more importance this year in view of the enlarged rail programs on many roads is whether, if the gage of the track is irregular, the first line of new rail should be gaged to the old rail. If this question is asked of trackmen, one may expect considerable variation in the answers, as well as some qualified answers.

Obviously, if rail is being laid in track having grossly irregular gage, it may be highly undesirable to perpetuate all of the defects of the old gage; yet there is little else that one can do, for in such a case the line and surface are likely to be as bad as the gage. It is difficult to conceive of grossly irregular gage unless the track has been neglected. If it is imperative to lay rail on such track the new rail should be gaged to the old rail, but the surfacing gang should be kept closely behind the rail gang to minimize the damage to the new rail.

It is only in rare cases that the gage will be extremely bad. Yet rail gangs still encounter too many instances where there are minor defects in both gage and line, for the old custom still persists in some quarters of doing only essential work on track that is to be relaid. Here too, the first line of the new rail should be gaged to the old rail, as before, and while it is desirable to surface it as soon as possible, the need for this will not be so acute as on track that has suffered serious neglect.

Present-day requirements for train speeds, even on many secondary lines, demand far higher standards of track construction and maintenance than were necessary formerly. Where these standards are observed, rail gangs will not encounter track conditions that were all too common in the days of light material and lower speeds. Yet the maintenance of these standards necessitates the use of expensive materials, which trackmen cannot afford to abuse.

To eliminate the possibility of damage to newly-laid rail, it should never be laid in track that is out of line, surface and gage. If the track is afflicted with these defects, it will be cheaper in the long run to assign a gang of sufficient size to precede the rail gang for the purpose of correcting these deficiencies. Rail that is once damaged can never be repaired, but must continue in the damaged condition throughout its service life. Large-section rails are too expensive to make it profitable to attempt to save money by neglecting to take any precaution tending to eliminate damage to them while they are being laid and during the subsequent interval of time until surfacing is completed.

Work Equipment

Its Use Will Continue to Expand

IF one studies the purchases of work equipment year by year over a period of years he cannot fail to be impressed by the ever-widening use of this equipment, as is indicated by the wide diversity of the types now in use. When the reasons for this expanding use are sought, it is found that while it is based on several factors, most of them point to the inexorable demand for greater economy as the fundamental and the most important of all of the reasons involved. The use of work equipment, as it is known today, began for two unrelated reasons: (1) to perform by mechanical means tasks that could not be done by hand, as exemplified by the pile driver and the bridge derrick; and (2) to replace man power for tasks that were too costly when done by hand, this being illustrated by the steam ditcher. The next purpose was to ease the burden of labor. It was soon discovered that the time required to do almost all items of maintenance could be shortened appreciably through the use of power machines, largely regardless of the size of the forces worked, and this gradually became one of the principal reasons for their use, especially as this discovery was made during the hectic days of the middle twenties, when time-saving became of prime importance.

It will be noted that one of the original reasons for the use of work equipment was based on economy, and that this thread ran through all later developments, although this was scarcely recognized at the time. Follow-

ing the debacle in 1929, all ideas relating to work equipment became greatly confused, for almost overnight an acute shortage of power machines was changed into a surplus of such magnitude that maintenance officers were dazed. Out of this confusion, however, there has grown a sounder attitude toward the advantages of work equipment, for while maintenance officers recognize that it possesses all of the advantages that were claimed for it at different periods, they are beginning to look upon it as a means of earning a profit.

This is as it should be, for the use of a power machine can be justified only when this use will result in savings of sufficient magnitude to make its ownership profitable. It is this changed viewpoint that makes it so certain that the use of work equipment will continue indefinitely. It is also to this viewpoint that the rapid expansion in its use can be attributed. It is this viewpoint that is stimulating manufacturers to exert greater effort to increase the efficiency of their machines and to develop others that are capable of performing operations that are still conducted manually.

It requires no prophet to predict that so long as the design and use of work equipment are kept on sound economic principles the use of power machines will continue to expand, and that there need be no fear on the part of any manufacturer that his market for such equipment will disappear. Rather, he can count on an expanding market. It is only those manufacturers who fail to improve their products and who thus allow more alert competitors to force them aside that need fear.

Off-Track Equipment

A Challenge to Manufacturers

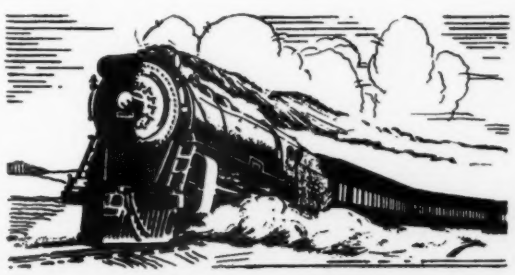
IF the appearance of off-track units of work equipment a few years ago appeared to be impracticable, recent developments have shown that such a conclusion was badly in error. With a smooth roadway of steel rails at hand, it is not surprising that some visualized with difficulty the advantages to be gained by operating work equipment along the track shoulder or over the right-of-way, entirely independent of the track rails. However, developments in recent years in increased train speeds, in the importance of eliminating train delays and in the necessity for greater economy through the elimination of work-train service and unnecessary flagmen, have combined to bring about an increasing demand for off-track equipment. To these considerations have recently been added demands of train and engine-service employees, which have, in many cases, not only offset the economies formerly attained through the use of certain units of rail-mounted equipment, but which have actually made these units too costly to operate.

Since the development of the modern crawler tread during the World War, it has been adapted to many classes of construction equipment that are, in part at least, suited to the requirements of railway construction and maintenance work. For example, today, crawler mountings are available on practically all of the heavier units of equipment, including power shovels, cranes, draglines, spreaders and graders, and either crawler mountings or wheel mountings are available on air compressors, electric generating sets, arc welding machines, grinders and mowing machines. Yet, with a few exceptions these machines were designed for general construction and repair work, with little or no consideration to the special requirements of railway work, especially with regard to the limited horizontal and vertical clearances required for operation about railway tracks. Thus, in spite of the large amount of other than rail-bound equipment that can be said to be available to maintenance officers, much of it is poorly, if at all, suited for a large and important part of their work, a situation which is restricting the purchase of such equipment and leading to the plea of maintenance men for machines which are designed more specifically to meet their requirements.

Maintenance men want especially equipment for ditching, bank widening and drainage work, including that for excavating, hauling and placing material, which, combined with adequate power and capacity, will not foul train operation. They want weed-destroying and ballast-working equipment that can be operated along the track shoulder, and they look toward developments in pile driving and material-handling equipment for bridge maintenance work that will operate free of the track and avoid the large expense involved in work-train service, much of which is required today for relatively simple and limited operations.

It will be difficult, no doubt, to develop off-track equipment suitable for certain types and classes of work required directly on the track and the roadbed area, and it is possible that such equipment will not be as effective in every respect as present rail-mounted equipment, but in view of what has already been accomplished in the development of off-track equipment and in the adjusting of working methods and organizations to use such equipment effectively, further important improvements in this direction should not be viewed as impossible.

One thing is certain, however, and that is that the further development of such equipment will not just happen. It will come about only as the result of concerted interest and effort on the part of equipment manufacturers to design and make available the kind of equipment that is demanded by present-day railway operation and methods. It is not too much to say that many maintenance of way men are becoming weary of being forced to purchase the equipment that is already available on the market because of the reluctance of some manufacturers to redesign their equipment and to develop new equipment suited to their specific needs. This situation presents a challenge to equipment manufacturers, a challenge that will not be without its reward for those manufacturers who face and meet it.



Roads Will Spend

$6,600,000 For Work

Every indication points to a year of enlarged maintenance activity. With prospects for earnings favorable and with a large tonnage of rail to be laid, the budgets of the railways for work equipment are showing increases in all important items, while the plans to buy more of the larger power machines is particularly noticeable. There will be an increase of about 10 per cent in both the number of units purchased and total expenditures for equipment in 1940, compared with 1939 purchases and expenditures

DESPITE the fact that the railways spent $6,000,000 for work equipment in 1939, and despite the further fact that the purchases for that year followed four years of relatively heavy buying, the railways of the United States and Canada will purchase 3,000 power machines and power tools and 800 other units in 1940. While this is only a small increase in the total number of units, the expenditures for work equipment will exceed by $600,000 the $6,000,000 spent in 1939 for 3,547 units, since the budgets for the present year include a greater number of larger and more expensive units.

These statements are based on information obtained from representative roads concerning the equipment they plan to purchase this year and have included in their budgets for 1940. This information indicated, and a number of roads said frankly that this is their intention, that railway officers are preparing to make more liberal expenditures for work equipment this year and that they are doing this because they recognize the economic value of power machines and tools in maintenance of way and structures work and are prepared to mechanize their forces as rapidly as earnings will permit.

It is generally recognized that the amount of rail that is laid in any year is a reliable index of maintenance activities as a whole for that year. Since the rail orders that have already been placed for 1940 requirements now exceed the total amount of rail applied in renewal in any year since 1931, except 1937, with a number of orders still pending, and since the prospects are that revenues will continue at a consistently higher level during the year, it is pertinent to consider the effect of these trends on expenditures for work equipment. In the belief that this is a subject of wide interest, and that information concerning the latest trends in the use of work equipment will be useful to maintenance officers, the chief engineers and engineers maintenance of way of the larger roads were asked what specific units of work equipment they expect to purchase during 1940.

Replies were received from 45 roads in the United States, representing more than 161,000 miles of lines, and 2 in Canada. Of these, 22 roads reported that they have already prepared programs involving the purchase of 1,165 units of work equipment representing 72 types, and 300 units other than power machines, such as rail and flange lubricators, snow-fighting and snow-melting equipment, motor-car and motor-truck trailers, pipe pushers, etc. Five other roads stated that they expect to purchase considerable equipment, giving only the total amount of money included in their budgets and the types of equipment they expect to buy. These amounts ranged from $34,000 to $500,000 for the individual roads and included substantially the same number of types as were mentioned by the 22 roads that gave detailed information concerning the types and number of units they expect to buy.

Fourteen other roads reported that their budgets have not been completed, although several of these said that their purchases will be substantial and a number listed the types they are expecting to buy. Only six roads stated that they do not expect to purchase any work equipment in 1940, but, in general, these are roads that have not been large purchasers of work equipment in the past, although they have usually bought a few units. It is of special interest in this connection, that whereas 124 roads, large and small, reported* that they had purchased 3,547 units of all types of equipment in 1939, 22 of the larger roads that have usually bought work equipment liberally are contemplating the pur-

Tractors Are Being Purchased for a Wide Variety of Maintenance Work

* Railway Engineering and Maintenance for January, 1939, page 18.

Equipment

In 1940

chase of 1,465 units in 1940. It should be noted also that these figures do not include the five roads that gave only the monetary totals of their budgets and the types of equipment they have in contemplation. Obviously the purchases of these five roads will increase these figures materially. Of the 47 roads reporting, 42 purchased some units of work equipment in 1939 and 3 made no such purchases, while 2 roads were not included in the tabulation for 1939, although they made substantial purchases.

The Crane, Equipped With Pile Driver Leads, Has Found Favor Among Many Maintenance of Way and Structures Men Because of Its Adaptability to Other Than Pile Driving Work

Many Types Included

As has been mentioned, the lists of equipment given by the individual roads cover a wide range of types for various maintenance operations, and an equally wide range in sizes, from ditcher-spreaders, locomotive cranes, motor trucks, tractors, power shovels and draglines, to small power-driven hand tools, such as clay diggers, paving breakers, power saws, wood borers, riveting hammers, chipping hammers, rotary brushes, paint sprays and similar tools. The 72 different types of equipment that were mentioned specifically as having been included in the budgets for 1940, covered requirements for laying and maintaining rail, handling material, cleaning ballast, surfacing track, renewing ties, destroying weeds, ditching and grading, fighting snow, transporting men and materials, paving, mixing and placing concrete, maintaining steel and timber bridges, and numerous other operations.

While most roads are probably better equipped with power machines for laying rail than for any other operation in maintenance, the enlarged rail programs for 1940 make it reasonable to expect that consideration is being given to equipment for laying rail and for caring for it after it is laid. This assumption is confirmed by the fact that approximately 400 units will be purchased for laying and surfacing the rail and for its later maintenance. These units will include spike pullers, spike drivers, bolt tighteners, adzing machines, rail cranes, rail and bonding drills, rail grinders, power jacks, power ballasters, tie tamping outfits, tie cutters, tie borers, tie pulling machines, welding outfits and rail straighteners.

Although the last three or four years have seen a revival of interest in the appearance of the right of way, and despite the fact that a relatively large number of weed-destroying units have been purchased recently, most maintenance officers admit frankly that the greater part of the equipment of this type that they possess is inadequate and outmoded. Indicating that plans are being made to rectify this situation as rapidly as practicable and that more attention will be given to the right of way in the future, approximately 100 units for destroying weeds will be purchased this year. These will include ballast discers and scarifiers, mowers, weed burners, extinguisher cars and chemical spraying equipment, with more of the mowing machines than of the other types. The mowing machines will include both the on-track and off-track types, the latter generally being for operation by tractors or as incidental equipment for tractors.

Ditching Equipment Ordered

Although considerable stress has been laid on ditching and other drainage during the recent difficult years, much of the equipment that has been employed for this purpose is now obsolete or worn out and requires replacement. While drainage is recognized universally as being important for the stabilization of any track, the shortening of schedules for freight and passenger trains that is so prominent a feature of railway operation at present, has intensified the need for more adequate and dependable drainage to insure stability of the roadbed. A survey of the budgets indicates that, in partial satisfaction of this need, not less than 50 earth-moving units will be purchased in 1940, including power shovels, draglines, ditchers, ditcher-spreaders, tractors and incidental

equipment, such as bulldozers, angle dozers, front end loaders, clamshell buckets and dragline buckets.

Off-Track Units Predominate

The advantages of the greater flexibility demonstrated by off-track equipment, compared with rail-bound machines have been claiming the attention of maintenance officers for a number of years. For this reason, there has been a marked trend toward the use of equipment of this design, largely because it can be used for work that is inaccessible to the rail-mounted units. More recently, however, the rising cost of work-train service, and particularly the decisions of the railway adjustment boards requiring the employment of train and engine-service men on rail-bound equipment that cannot be removed readily from the track, have combined to accelerate the movement toward the use of equipment that is free from all of the restrictions imposed by rail mountings. In view of these facts, it is not surprising that all of the earth-moving equipment that will be purchased in 1940 will have crawler mountings.

Until recently, the trend toward the use of cranes with crawler mountings has been much slower than for earth-moving equipment. The reasons for this are not difficult of determination, since much of the service performed by cranes is out on the line and the machines must frequently be moved for long distances quickly. While this can be done without difficulty in the case of the smaller cranes, real difficulties confront an officer who must move a large crane on crawler mountings to some distant point over night. For this reason, until recently, crawler mountings for cranes have generally been confined to machines employed in material yards or for jobs remote from tracks. However, the same considerations that have hastened the use of off-track excavating units are beginning to have a definite influence on the types of mountings for cranes, except those used for laying rail. It is of interest, therefore, that of the 35 cranes included in the 1940 budgets, including 6 locomotive cranes and 24 others ranging from 5 to 40 tons capacity, 20 will be on crawler mountings. Several of these machines will be equipped with clamshell or dragline buckets, so that they can be used for excavating as well as for handling material, and two will have magnets to increase their range of usefulness.

In an effort to determine the magnitude of the trend toward modernization, the officers who participated in this study were asked to state how much of the equipment they intend to purchase represents additional equipment and how much is intended for replacement. They were also asked how much of their equipment is approaching the end of its service life and how much is not modern. As was expected, the answers to these questions varied between rather wide limits.

Some officers said frankly that they have little equipment that can be considered modern, the percentage of outmoded units ranging up to 90 per cent, with a surprisingly large number of roads reporting that

Many Motor Cars Will Be Purchased To Replace Obsolete and Worn Out Units

more than 50 per cent of their equipment is not modern. Fewer were willing to admit that their equipment is approaching the end of its service life and that it requires replacement because it is worn out, although the percentages given ranged up to 60 per cent. Most of these officers stated that it is their custom to maintain their equipment in good physical condition at all times. Other officers stated that for several years their purchases have been predicated on the number of worn out and obsolete units in service and that today none of their equipment is worn out and that practically all is modern.

Manufacturers have sometimes expressed the fear that some types of equipment are reaching the point of saturation and that the future market will be confined to replacements, and that these replacements would be likely to be restricted by a desire to get the last ounce of service from every unit. That this fear is groundless is indicated by practically all of the officers who gave information concerning this matter. With few exceptions, the replies indicates that the need for more equipment is so great that most of their purchases are being made for the purpose of adding to the units already in service, and that many of the old units are being retained beyond their allotted life to avoid the alternative of either letting the work go or reverting to hand work.

Two classes of power equipment have been used longer and in larger numbers than almost any other type, the most outstanding of which is motor cars. Because of their practically universal use, motor cars should be nearer the so-called point of saturation than other types and should, therefore, demonstrate the soundness or unsoundness of the assumption that the market will be closed to further development and new designs. Despite the fact that practically every road in the United States and Canada now has enough motor cars in service to equip its regular forces and despite the further fact that the 124 roads that reported their purchases for 1939 bought 1,533 units of this equipment during the year, more than 1,600 motor cars of all types will be purchased in 1940.

Tie-tamping equipment provides a similar and almost as convincing an illustration of the fact that saturation does not close the market to further development and new designs, for while this equipment is used more widely than any other except motor cars, it is still not used universally. In considering this equipment, one must take into account its higher cost, compared with motor cars, wherefore there is a tendency on some roads to avoid replacing these units as long as they can be kept in operation, giving little regard to the question of the efficiency of these older units compared with the newer models.

Furthermore, the high cost of what had come to be considered standard equipment for tamping ties made it impractiable from an economic standpoint to equip section and other small gangs with mechanical tie tampers. As a result, the development of smaller and less expensive units for use by these smaller gangs has been stimulated and an attractive market created for these smaller units without decreasing the demand for the larger outfits. It is of interest, therefore, that at least 400 tie tamping outfits, large and small, will be purchased in 1940, compared with 393 such outfits purchased in 1939.

That not a few of these outfits are being purchased for modernization is evidenced by the fact that several roads said specifically that they are replacing existing units with new units having higher efficiency. On the

other hand, the smaller units are, almost without exception intended as additions. These outfits include both the electric and pneumatic types, as well as the direct-drive type.

Portable Power Tools

There was strong indication in the budgets that are under discussion, that the trend toward a wider use of small portable power tools is gaining momentum, for, with few exceptions, the roads included in this survey expect to purchase from one to several sets of small bridge and other power-operated hand tools. From the information given, it is estimated that more than 300 such tools of 18 different types will be purchased in 1940, including wood-cutting and boring tools, steel-erection tools, paint-cleaning tools, air and power hoists, clay diggers, pneumatic sheet-pile hammers, etc. Furthermore 10 electric lighting plants and 40 other floodlighting units will be purchased. Portable tools are of little value without adequate provision for their operation, and the budgets indicate that 30 generators, 40 compressors and 15 direct-drive power plants for driving these tools will be purchased during 1940, and that 10 additional generators will be purchased in connection with the lighting plants.

One of the interesting trends disclosed by a study of the work-equipment purchases from year to year is that of the increasing use of the highways by the maintenance forces. That the trend toward such use is continuing is shown by the budgets which indicate that not less than 100 motor trucks, several passenger automobiles and 45 truck trailers will be purchased during the current year.

Expanding Use

One who studies the purchases of work equipment over a period of years cannot fail to be impressed with the ever-widening use of power machines and power tools, as is indicated by both the increasing number of units purchased year by year and the increase in the number of types available. No longer than 20 years ago, a maintenance officer seeking mechanical aids in his work would have been compelled to confine himself to motor cars, tie tampers, locomotive cranes, clam-shell buckets, steam shovels, pile drivers, bridge derricks, concrete mixers, air or steam hoists, and a few other semi-portable steam-driven units. In contrast, 125 different types were purchased during 1939, and the relatively few budgets that form the basis for this study include 72 different types for a far wider range of work than the few types that were available two decades ago were adapted for.

Another impressive fact disclosed by these studies is that, in addition to the variety of work that is becoming mechanized, almost all maintenance officers are keenly aware that a real shortage of work equipment exists on their own roads. In other words, the inexorable pressure for the development of greater economy in every operation is dissipating the self-satisfied attitude that was apparent in some quarters no longer than five years ago and is replacing it with a keen appreciation of the fact that unless these roads are able to develop a fuller and more intensive use of work equipment they will be unable to maintain the higher standards of work that are being demanded of them, as well as at lower cost.

A New Factor Injected

All indications point to the fact that today few maintenance officers are reluctant to recommend the purchase of work equipment, either for the purpose of replacing worn out or obsolete units or to add to those they already possess. Rather, with most of them it is a matter of deciding what their most pressing needs are and then of preparing their budgets accordingly. With few exceptions they are eager to buy to the limit of their resources, for they realize as never before that under any conditions, except those of cheap labor, work equipment alone leads to economy, and that under existing conditions it has become impracticable, without mechanical assistance, to turn out either the amount or the quality of work necessary.

Almost within the last few weeks a new factor has been injected into the situation with respect to the use of work equipment, by the action of the administrator of the wage and hour division of the Fair Labor Standards Act, in appointing a committee to consider recommendations as to the future minimum wages on the railways, up to a possible level of 40 cents an hour, which "will not substantially curtail employment." It is obvious to any one acquainted with the railway situation as it exists today that any increase in the minimum wage of maintenance forces will stimulate the use of work equipment and will, therefore, curtail employment, since the volume of work necessary will not be changed. It is equally obvious that the higher the level of the minimum wage is raised, the greater will be the stimulation to use work equipment. As a matter of further interest in this connection, the railways have offered testimony at the hearings before the committee that indicated that some types of equipment will save enough money in a single season to pay for themselves, after deducting all items of overhead expense and operation from the savings they are able to demonstrate.

None of these facts should be lost sight of in any consideration of the purchase and use of work equipment during 1940. It should be kept in mind also that while the foregoing discussion relates primarily to officers who are experienced in the use of work equipment, there are many roads that as yet have no work equipment of any type, except motor cars, and that not a few in this latter group are beginning to realize that they must mechanize their forces or reduce their maintenance standards to a lower level. For this reason it may be expected that, as happened last year, some roads will begin to use power machines, other than motor cars, for the first time this year and that the list of those employing work equipment will increase from year to year.

Only a few of the types of equipment that will be bought in 1940, as indicated by the budgets, have been included in this discussion, for a complete discussion of all of them would require much tiresome detail. However, among the more important types that will be purchased in considerable quantities are concrete mixing and placing equipment, power-operated bridge jacks, road-grading and rolling equipment, steam pile hammers, welding outfits, tie pulling and cutting machines, tie borers, pipe pushers, tractors and incidental equipment, portable centrifugal pumps, trench pumps, rail and flange lubricators, paint spraying equipment, dump cars, etc.

Similarly only a few of the trends that are disclosed by a study of the budgets have been discussed. Enough have been cited, however, to show that there is an overall trend toward a wider use of equipment of all types and that there is a strong desire on the part of maintenance officers to modernize the equipment they already have in service, so far as it has been outmoded by improved designs. It is evident also that the use of power machines and tools is expanding into new fields, for at least two machines were included in the 1940 budgets that have not appeared in budgets for previous years. It is equally evident from the range of types included in the budgets, as well as the total number of units included, that maintenance officers are willing to buy to their limit of their resources and are ready to adapt their plans and practices to the extent that may be necessary to utilize new types as soon as their worth has been demonstrated.

What Work

Modern Work Equipment Has Brought About the More Careful Programming of Work and the More Efficient Organization of Forces

Heavy Bridge Work, Track Surfacing and Rail Laying Have Been Fully Mechanized to Large Advantage On Many Roads

THE use of power tools and work equipment is coming into its own in maintenance of way and structures work on the railways. Whatever may be said of the reticence of engineering and maintenance men in adopting such equipment widely in the past, it does not hold today, as these same men now, in the face of constantly increasing demands for efficiency, speed and economy in carrying out every phase of their work, realize that it is only through the extensive and effective use of equipment that they can hope to meet these demands.

The truth of this situation, and the vital place that work equipment now occupies in practically all classes of maintenance of way and structures work, is vividly set forth in the statements of officers in charge of these classes of work on five different roads that follow, officers, all of whom have come up through the days of limited equipment, and have, therefore, a keen realization of the handicaps of the past, and of what it means to be equipped adequately to carry out their work under present conditions.

Means Economy, Efficiency, Safety

By J. R. Derrick

Assistant to General Manager,
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THE value of work equipment to the individual railroad officer is far reaching. In the early days of railroading, which are commonly referred to by our present supervisors as the "pick and shovel" days, we thought we were getting along fine. Labor was cheap and, no doubt, was less efficient than it is today. Equipment and track materials were lighter. The demand for a sturdy, permanent roadbed and track structure was far less than it is today.

As the demand for better track developed and the cost of labor and the weights of materials increased, the need for work equipment increased in proportion. A high standard of track maintenance, produced with the greatest economy and efficiency, is the ultimate end for which we are striving. Without present-day work equipment, our progress in carrying out maintenance of way work to this end would be severely handicapped.

Many Improved Methods

In the old days we could "plaster" our roads with work trains and extra gangs; delays to train movements were considered a necessity and the cost was not questioned. Today, however, with present traffic and the ever-increasing demands for heavier trains and greater speed, it is practically impossible to utilize main tracks for carrying out maintenance of way work and we have had to resort to means to meet this condition. These means have been found to a very large extent in the use of modern work equipment.

In the old days, we used steam shovels which required five to eight men to operate, besides requiring the service of the track forces to build and remove the tracks over which they were operated. For hauling material from these shovels, we used work trains consisting of small capacity dump cars operated by hand. The material was spread by hand or by shop-made spreader cars, operated manually. All of these operations required time and caused serious delays to regular train movements.

The modern way to do this same class of work is to use a gasoline shovel of the crawler type, working clear of the track under its own power, loading into motor trucks for hauling to the dumps, where the material is spread with bulldozer-equipped tractors—none of which operations involve interference with train movements. Thus, for example, double track and the extension of side tracks can now be constructed without inter-

Equipment Means to Me

Confronted with constantly increasing demands, maintenance of way and structures officers on the railways are finding modern power tools and work equipment their salvation. That this is true is clearly evident in the comments of five such officers, presented herewith, on what equipment means to them

fering with or being interfered in any way by train operation.

Under present-day conditions and requirements, a railroad cannot afford to lay rail by hand, with the consequent delays occasioned to traffic, when, with a properly organized mechanized force, it can lay from one to two miles of track in a day, complete to the picking up of all released material.

In addition to the advantages already mentioned as inherent in suitably designed work equipment, the quality of the work performed with the aid of such equipment is a large and important factor. For example, in the adzing of ties by mechanical means, no ties are damaged, whereas by the old method of hand adzing, in which no two men worked exactly alike, a very unsatisfactory job usually resulted, and invariably a number of the ties were damaged by excessive cutting.

Promotes Increased Work

The savings which are effected through the use of modern work equipment have a far-reaching effect upon the amount of work which can be authorized. If it cost as much to do work today as it did years ago, improvements and progress would be curtailed seriously. In other words, aside from the fact that the use of modern work equipment is essential under present conditions, the savings effected through its use permit additional improvements, and thereby contribute to progress.

From the standpoint of safety, we can safely say that we are now doing the same classes and quality of work as in the past, with the number of personal injuries and deaths reduced to a very small percentage of what they were 20 years ago. For a large part of this improved record I give credit to our present-day methods and our increased use of modern work equipment. In brief, to me, work equipment means more economy, more efficiency, greater progress and increased safety.

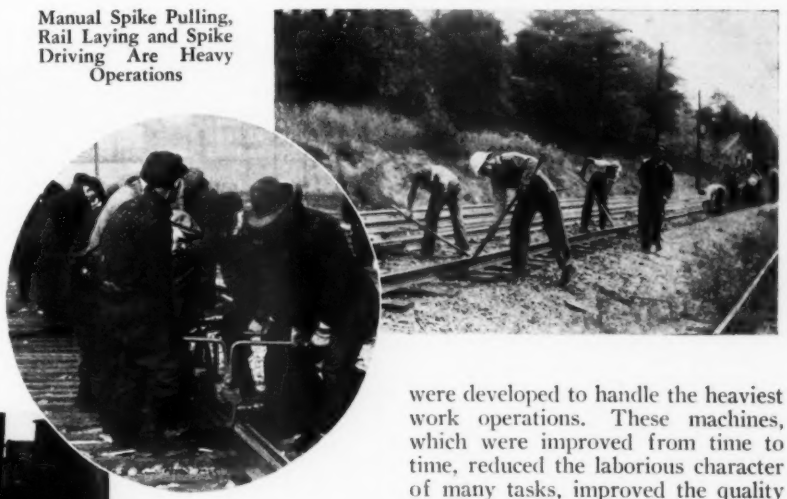
Made It Possible to Weather the Depression

By F. H. Cramer

Bridge Engineer,
Chicago, Burlington & Quincy,
Chicago

WHEN I look back some years and see the difficulties that were encountered in maintaining railway properties with the limited number and types of power tools and work equipment that were available, present-day work equipment means a great deal to me. In the early days, practically all classes of work were done by manpower, with large forces of men. However, with the growth of the railways and the increased intensity of their operation, some units of work equipment, such as steam shovels, spreaders, pile drivers and derricks, were developed to handle the heaviest work operations. These machines, which were improved from time to time, reduced the laborious character of many tasks, improved the quality of the results secured, and effected large savings of time and money.

The realization of these advantages gained through the use of work equipment gave impetus to the development and use of additional units of equipment. However, it was not until the beginning of the depression that the use of work equipment of all types, essentially to effect economies, be-



Manual Spike Pulling, Rail Laying and Spike Driving Are Heavy Operations

Many Roads Would Be at a Loss if They Had to Go Back to the More Laborious and Costly Manual Method of Laying Rail

came increasingly necessary to meet the drastic reductions in revenues and maintenance allowances. Increases in wages were also a stimulus to the greater use of power tools and machines, and to their development to make them more effective. Today, the effect of various types of work equipment on the carrying out of maintenance of way and structures work has become so large that it is doubtful whether the necessary amount and character of work required could be carried out if it became necessary to return to hand methods.

Many Improvements Made

Through the years, many changes and improvements have been made in the equipment that has been available to railway men. The motor car, which was developed to eliminate the laborious work of pumping hand cars and to shorten the time consumed in traveling to and from work, is an outstanding example in this regard. From the standpoints of economy, speed and safety, motor cars are essential to the forces carrying out all classes of maintenance work. Equally important developments have been made in many types of equipment used primarily by the bridge and building forces, such as cranes, pile drivers, air compressors, power saws, paint sprays, electric generators, wood borers, power pumps, etc. Modern pile drivers, for example, are a great improvement over the old style wood pile drivers equipped with drop hammers, although many of the latter are still in use. Modern drivers are self-propelled and full-revolving, and are equipped with single or double-acting steam hammers which have greater driving output than the drop hammer. These modern pile drivers meet all of the requirements of today for pile driving in new construction, routine replacements and emergency work, and do so more satisfactorily, quicker, and with greater economy than the older types of drivers.

Another type of machine used much today to advantage is the convertible pile driver and crane. With its long boom, this unit can drive longer piles than can be driven with the standard type of pile driver, and, at the same time, is available for a wide range of derrick work. Still another important type of equipment is the steam or oil-operated, self-propelled crane, which, equipped with a long boom, is adapted to a wide range of bridge construction and maintenance work. Cranes of this type, with capacities of 7½, 25 and 60 tons, are indispensable for erecting steel spans. The smaller of these cranes should be fully equipped for operating clamshell and orange peel buckets and for doing other classes of work, such as handling material and excavating.

Another machine which means a great deal in railroad bridge work is the large wrecking crane. Cranes of this type are used to assist in extremely heavy steel and concrete erection work, and are of great value in the restoration of washed-out structures and roadbeds. For light work, such as the handling of timbers in the renewal of structures, the handling of steel sheet piles in cofferdam work, the placing of pipe culverts, excavating, back-filling and other similar operations, the small, full-revolving, self-propelled crane of 7½-tons capacity has proved the most effective and economical. Other types of equipment which are being used today in bridge and trestle work with good results and large savings are those with crawler mountings, including tractors, draglines, bulldozers and shovels. Tractors equipped with carry-all scrapers and bulldozers are particularly effective in restoring washed-out embankments and side washes, and for cleaning tracks covered with debris.

Air compressors and electric generating outfits equipped with power saws and augers are valuable as time-savers in cutting off piles and boring holes. Likewise, power track jacks are of large value in extensive line and grade revision work and are in great demand by maintenance men.

Equipment Pays Large Returns

By A. E. Pearlman

Engineer Maintenance of Way, Denver & Rio Grande Western, Denver, Colo.

PRESENT-day work equipment will save from 10 to 200 per cent annually on the original investment. The following tabulation shows the estimated savings possible with various types of work equipment:

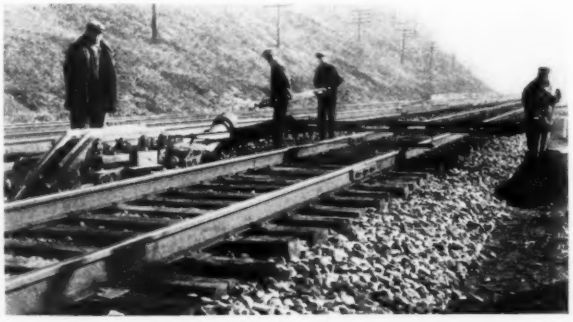
Estimated Savings Possible Through the Use of Work Equipment

Type of Equipment	Estimated Annual Return On Investment—Per Cent
Draglines and shovels	100 to 200
Bulldozers and loaders	100 to 200
Spike pullers	50 to 100
Adzers	50 to 100
Spike drivers	50 to 100
Power bridge tools	35 to 75
Auto trucks	30 to 60
Rail grinders	20 to 70
Bolting machines	100
Concrete mixers	50
Rail layers	50
Weed mowers	30 to 60
Power jacks	100
Track motor cars	60 to 100

Draglines, shovels, bulldozers and loaders are very flexible units. The fact that their use involves no interference to traffic, constitutes a most desirable feature. These classes of equipment are adapted especially for bank widening, channel changes, line changes, passing track extensions, building yards, cleaning cuts, digging trenches for bridges and culverts, loading and unloading rail, digging surface ditches, cleaning up slides and wash-ins, repairing washouts, digging trenches for pipe lines, and loading ballast, rip-rap, sand, gravel, cinders, etc. The savings to be derived from the use of these units of equipment today, as shown in the foregoing tabulation, are based on the fact that the newer types are capable of performing all of the kinds of work mentioned, whereas the older types were limited in their capabilities.

Large Saving in Track Equipment

The use of modern rail laying equipment, such as spike pullers, adzers and spike drivers, has materially increased the output per man-hour and reduced unit costs. Spike pullers have added to safety and economy. Countless injuries have



Ballast Cleaning Would Be a Most Expensive Operation If It Were Not For Power Equipment

been sustained by workers employing the old method of removing spikes with bars, while with the new type spike pullers, this work is accomplished more quickly and safely and the spikes removed can be re-used without substantial costs for straightening. Adzers eliminate one of the greatest hazards in rail relaying operations, cause less damage to the ties, leave a better bearing area, and save a great amount of time. Spike drivers also eliminate the hazard to safety involved in driving spikes with a maul, save time, and do a better job of spiking.

The newer types of rail layers have been used with gratifying results. The fact that they can be equipped to perform work other than laying rail widens the scope of their usefulness and brings them well within the realm of money-saving equipment.

Bolting machines have also proved their value in changing angle bars, tightening bolts, etc., in rail laying operations. Large savings in time and labor may be effected through their use.

Rail grinders are used by many roads and have proved well forth the investment for carrying out such work as surface grinding, beveling joints, and grinding the overflow from frogs and switches. Damaged rail ends, switch fixtures, etc., are reduced to a minimum by the use of these machines.

The use of power jacks in grade raises, track construction, etc., has resulted in material savings. On one major project in which the writer was engaged, time studies showed these jacks to be returning their original investment every ten days.

Speed B. & B. Work

Compared with hand methods, bridge and building power tools effect substantial savings of time on bridge and building work, for such work is accomplished in 35 to 75 per cent less time with the aid of power tools.

Auto trucks are being used to great advantage by many roads for the transportation of men, tools and materials in bridge and building, track, water service, telegraph and other types of work. The elimination of delays in transporting outfit cars from one location to another by train, the expense in connection with moving these outfits, and the delays encountered when gangs are transported on motor cars, comprise the main factors in the economics effected through the use of trucks. Another important factor arises from the fact that with the use of trucks, gangs can complete more than one job each day, whereas, when depending upon trains or other forms of rail transportation, they could not move from one location to another quickly enough to do this.

Track motor cars are indispensable to the railroads in most cases and their value from an economic standpoint is so apparent that little need be said regarding their advantages.

Makes Possible Specialized Gangs

By I. H. Schram
Engineer Maintenance of Way,
Erie, Jersey City, N. J.

IN a career of more than 30 years, the writer has seen work equipment on the railroad by which he is employed develop from a beginning of hand cars, push cars and track jacks to its present wide range, wherein it now holds a key position in the carrying out of maintenance of way work. This is not only because of the labor-saving value of this equipment, but, of greater importance, because of the effective changes that have been made possible in carrying out maintenance of way work through the use of work equipment, employing highly organized forces.

During the last decade, in common with other roads, the use of specialized gangs on our road for carrying out the heavier classes of maintenance work has been extended until practically all phases of track, bridge, dock, painting and similar work are being handled by specialized gangs. All of these gangs have been studied and their work analyzed, and the activities of each man are carefully planned. Furthermore, and of greatest importance, the tools and equipment for each gang or portion thereof are definitely fixed. Thus, each gang's work is planned and arranged around the machine or machines with which it is supplied, and its output is governed largely by the capacity of the mechanical equipment. This has resulted in large economies, and the further mechanizing of work operations. Present-day standards of excellence in track alinement, surface and cross-level are absolutely dependent on machinery, because the specialized gangs for ballasting, resurfacing and other roadway work have been trained to attain such high standards with the aid of work equipment.

Welding Has Greatly Prolonged the Life of Rail, With Large Resulting Economies

With the organizations mentioned, it has been possible to handle maintenance work in the manner necessary for the high speeds and heavy locomotives involved in modern operation, with no larger maintenance allowance than was granted previously.

Aid to Track Forces

With track work involving the major part of the work of the maintenance of way department, the greatest part of the work equipment purchased has naturally been for the track forces. Thus, the earliest labor saving devices, including the motor car and power rail loader, followed by power tamping tools, were for the track forces. Most gang changes were based on this basic equipment and later machinery largely supplemented it. The motor car permitted section work to be rearranged; section gangs to be relieved from many heavy renewal operations, and their activity restricted to routine tie renewals, ditching, policing, cleaning, surfacing, adjusting switches and similar work. As a result, large economies have been achieved. Gangs thoroughly equipped with machinery now perform the major tasks, and the work is being done more expeditiously and with fewer man-hours. Gangs so equipped lay rail, with each operation, such as spike pulling, rail handling, adzing, bolting and spiking, being done by a machine developed for the purpose.

Ballasting, particularly in stone, has been made a function of specialized gangs, and some of the most ingenious machinery used by the maintenance of way forces has been devised to crib, clean and tamp stone-ballasted track. For many years the problem of cleaning stone ballast made it a very expensive type of ballast to rework.

Hand cleaning was prohibitive in cost and was slow; raising track on dirty stone was expensive in ballast replacements and interfered with clearances. Cleaning is now being performed by cribbing machines that remove the fouled stone from between ties to a depth of several inches below their bases, and at a cost that is a small fraction of that involved in hand cribbing. The ballast is cleaned with moles that lie below the clearance limits of train equipment and clean between the tracks and on the shoulders where the track has been cribbed. Clean ballast is tamped with pneumatic or other power tampers and is finally dressed with a ballast shaper.

General surfacing is also done with power tampers in the hands of special surfacing gangs, which do the work cheaper and faster than would be possible with large section gangs. Other work, such as the building up of rail ends, general bolt tightening, the changing of joint bars and grinding about frogs, switches and crossings, is also being done by special forces with the aid of machinery.

The development in recent years of off-track ditching equipment has been quite revolutionary. Crawler-mounted shovels, draglines and bulldozers have been introduced to supplement the older types of ditchers and spreaders which were mounted on cars, and are today carrying out a large share of the roadbed widening and ditching programs.

Big Help to B. & B. Forces

Perhaps nowhere has the mechanization of forces been more productive of results than in bridge and building and dock work. Only a few years ago, the equipment available for doing these classes of work was about the same as it had been through the age of wooden ship building, when crosscut saws, ship augers, hand wrenches, blocks and sledges were the only tools known. The most startling innovation was the pre-framing of timber before treatment, which called for the substitution of machine work on a factory basis for hand work in the field. Now, a majority of timber work is so handled. In much work, particularly on docks, depending on driven piles for a foundation, preframing is limited, but even here the field work is machanized with power saws, drills, spike drivers and wrenches, and with pile drivers equipped with air compressors.

Power Saws Have Effected Large Savings in Bridge and Building Work

These developments in bridge and building work have resulted in economies similar to those realized in track work, and, in turn, have made bridge and building forces largely dependent on machinery for results. In many cases, the results being secured are amazing. For example, a dock building gang was furnished with a barge equipped with a gasoline-engine-driven compressor of 160 cu. ft. per min. capacity. This compressor furnished power for an air hoist, chain saw, impact wrench, air drill and spike driver. As the result of being so equipped, every operation involved in the work done by this gang was performed in less than half the time that had been required previously when hand tools were used. This is an indication of the important part that work equipment is playing in all classes of maintenance work, in enabling us to keep ahead of modern operating conditions with the limited amount of money that has been available.

Presents Problems—But I Would Be Lost Without It

By J. J. Clutz,

Supervisor of Track,
Pennsylvania,
Trenton, N. J.

TO me, as a track supervisor on a high-speed, multiple-track territory with heavy rail and stone ballast, handling a dense freight and passenger traffic, work equipment affords the means for maintaining these high-speed tracks economically to permit comfortable and safe riding conditions at all times. I also find work equipment of considerable value in maintaining our yards and branches.

Brings Responsibilities

Work equipment is not an unmixed blessing. Its use involves numerous "headaches" for the supervisor or roadmaster. In the first place, each unit represents a certain investment of capital funds. Whether the machine is working or standing idle, interest on the investment, taxes and a certain amount of depreciation go on. Hence, the upservisor or roadmaster must program his work so that, so far as possible, the equipment available to him is kept busy throughout the working season. He must see that it is sent to the shop for overhauling, if needed, during the season when weather curtails its use, so that it will not break down during the busy season. He must try to develop new uses for it to increase its usefulness throughout the year. For example, equipping snow flangers with a ballast-leveling device has made them valuable labor savers the year around.

He must see that the proper force is set up to use work equipment, so that its full possibilities are realized. For example, if an air compressor is capable of operating 16 pneumatic tamping guns, sufficient force should be assigned to work with and ahead of it so that it can be operated to its full capacity. He must see that a properly qualified employee is assigned to operate the equipment so that it is run efficiently, properly and safely. He must see that a proper flow of fuel, supplies and materials is set up so that his machines are not forced to shut down for lack of them. He must see that replacements are on hand for parts subject to failure. He must have a repairman qualified to make field repairs on the equipment so that it will not be tied up for long periods by minor breakdowns. He must see that proper daily reports covering the use of each machine are prepared and forwarded, giving all information necessary for adequate cost accounting on it and on its type of operation. When new machines are purchased for specific purposes, he must study them carefully to insure their most efficient operation and to develop new uses for them. He must work with the manufacturers to suggest improvement in strength or design to adapt the machines better to the work on his territory.

These are "headaches" which must be taken care of where work equipment is used. However, more than offsetting them is the greater degree of uniformity, economy and safety in the work performed.

No two men work alike. Some men

are stronger than others; some are more efficient; some are more careful and conscientious. All men tire as the working day passes and do less efficient work toward the close of the day than they did at the start. A machine does not tire. Machines of the same type, properly maintained and operated, will produce equally good results throughout the day. As the result of variation in the skill, strength and conscientiousness of the individual men in gangs, hand-tamped track is likely to be slightly irregular. Machine-tamping produces a much more uniform surface and, therefore, the track maintains good line and surface for a much longer period of time.

Mechanical tamping equipment is valuable not only for out-of-face work, but also for spot work, particularly since various manufacturers have developed small, highly portable outfits, operating two or four tamping tools. Using such equipment to spot surface and tighten up track which was given a heavy working out-of-face the previous year results in maintaining a uniform surface for several years with little or no additional work. It is then frequently possible, by using the small mechanical tamping outfits to spot surface again, to tighten up the stretch again three or four years after it was given the original heavy working, so that a fairly uniform surface is provided for as long as six years between heavy out-of-face operations.

Work equipment insures greater uniformity in the tightening of bolts than is possible in hand tightening.

The surface grinding of joints, particularly in new rail, is a valuable means of economy in improving riding conditions. Mill tolerances necessarily produce some variation in rail heights. This results in impact at the joints which produces the effect of poor surface, and which, if not corrected, will ultimately break down the running surface of the rail and cause end batter.

Effects Large Economy

It is apparent that, where uniformity of work is obtained, there is economy, since any irregularity in track, no matter how slight, becomes greater under traffic. Not only is a superior grade of work done with work equipment, but a given number of men can produce a larger number of work units per day than if they were doing the work by hand. Striking examples of this are seen in the use of the Jordan spreader in cleaning side ditches and in shaping new ones, and in the use of snow plows, flangers and spreaders in moving snow from the tracks. Literally they do the work of hundreds of men. A recent development in this line is the use of power rotary sweepers for removing snow from station platforms, which must be kept clean for heavy passenger movements and for the handling of mail, express and baggage. One man operating such a machine can do the work of a dozen men with shovels and brooms. The machine can also be adapted for removing snow from sidewalks, for cutting station lawns and right-of-way during the summer, and for cleaning dirt, etc. from station floors, piers, warehouses and other areas which must be cleaned periodically.

Spreader - Ditchers, Dump Cars and Power Shovels Have Been Invaluable in Roadway Maintenance Work

In laying rail, particularly in hot weather, spike drivers are labor savers. Driving spikes all day by hand in a large-scale rail laying operation is a "man-killing" job, and on hot afternoons men frequently drop out exhausted. Using pneumatic spike drivers, 15 men, including those setting the spikes, can easily keep up with a gang laying a rail a minute, whereas 24 men with spiking hammers would have difficulty doing this. Similarly, 6 men with power spike pullers will do the work of 12 men with claw bars. Moreover, the power spike puller will remove the spikes from the ties without bending them, so that they can be reused if they are not throat cut or corroded. When spikes are pulled by claw bars, it is usually necessary to straighten them before they can be reused.

Through the use of work equipment, economies are possible which cannot be realized in any other way. This is true particularly of portable power grinders. By cross grinding the rail joint, the overrun metal at the end is removed, eliminating chipping. Worn and chipped switch points can be ground back and reshaped in track, multiplying their life several times. Lipped stock rails can be reground in track, so that the switch rail stocks up perfectly, thus preventing its becoming chipped or broken. Frogs and guard rails can be reshaped by grinding. Welded metal can be ground to a true contour.

Corrugated and not too badly burned rail can be ground smooth in track by power grinding cars, thus improving riding conditions, postponing breakdown of the surface, prolonging the service life of the rail, and practically eliminating the vibration of equipment. Mechanical bolt tightening not only produces greater uniformity in tightening, but also results in longer life for bolts, splice bars and rail, as the fishing areas of both bars and rail wear less if the bolts in the joints are kept uniformly tight. Rails can be cut in the field with a cross grinder very quickly and with no damage to the fishing space, giving square ends, in less time than is required with a hammer and chisel. A power rail drill will make five bolt holes in the time that a hand drill requires to cut one.

Heavy materials can be handled safely in material yards, on work trains and in rail laying operations by cranes. When the handling of such materials by hand was necessary, injuries were frequent. Using a highway truck crane for loading material not only cuts down the number of men necessary, but also prevents injuries.

Power spike pullers not only minimize the probability of personal injuries resulting from spike heads pulling off, but also eliminate the all-too-frequent finger injuries resulting from claw bars slipping off spikes and catching the hand between them and the opposite rail or the ballast.

These advantages of greater uniformity, economy and safety in carrying out maintenance of way work with work equipment more than offset the extra supervision required. I would feel lost without a well-balanced allotment of such equipment.

Roads Need More Power Tie Tampers

What I Would Buy

Chief Maintenance Indicate That They Purchases of Work

EVERY person in contact with maintenance of way and structures work knows of the rapid advances that have been made during the last 10 or 15 years in mechanizing the many phases of this work. At the same time, they are equally well aware of the fact that, lacking the funds for purchases, few maintenance of way and structures organizations have all of the equipment that they could use in the interest of greater economy, improved quality of work, and increased safety of operations. In fact, it is common knowledge that many maintenance officers are today handicapped severely in carrying out their work by the lack of suitable or adequate power tools and equipment.

Just how important this factor is, however, and the extent to which the railways are inadequately equipped, have been largely matters of conjecture. For the purpose of throwing more light on this situation, to the end that it may be faced more squarely, *Railway Engineering and Maintenance* asked the chief maintenance of way officers of six railroads to discuss the situation on their respective roads, giving emphasis to their *present needs* for power tools and equipment, and to the purchases they would make to fill these needs today if they had the money. For obvious reasons, these statements must be presented anonymously but the combined mileage of these six roads exceeds 21,000.

These comments should be most enlightening to railway officers and to the manufacturers of work equipment alike, for they indicate not alone that there is a large unfilled need for work equipment to effect essential economies in maintenance of way and structures work, but also that this demand will be satisfied through additional purchases just as soon and as quickly as funds can be made available for this purpose.

Replacement Needs Large— New Requirements Larger

By System Maintenance Officer

TO justify its first cost and expense of operation, work equipment (1) must do work which cannot be done otherwise; (2) it must do work for which manual labor cannot be secured; (3) it must do work better than it can be done by other means; or (4) it must do work more economically than it can be done otherwise.

Under the first heading come such heavy operations as the driving of piles and the handling of earth, rock and other heavy materials in large quantities. In this classification we have all of the equipment that we need, and I believe that most other roads have.

The second justifying reason was important at one time when labor was scarce and hard to secure, but has not been valid for a number of years and is not now. In fact, in view of present unemployment, some people argue that equipment should not be used to displace labor; that we should even lay up our equipment and use man power. I cannot subscribe to this. It is our responsibility to perform work as economically as possible, and if equipment aids in this, it should be used. Failure to use equipment would not, in our case, increase employment. In fact, the result would more likely be the reverse, as we have only a given amount of money to spend, and if it is spent wastefully, the detriment which would show up in our fixed property would react unfavorably on labor.

A Number of Roads Would Purchase Power Adzing Machines

If I Had the Money

Officers of Six Roads Would Triple Their Equipment in 1940

Some Roads Would Buy Rail Cranes

From the foregoing it is evident, therefore, that the purchase of work equipment must now be justified by its ability to do work better or more economically than it can be done otherwise,

Better Equipment Available

Purchases of new equipment are made either because we do not have the necessary number of units to do our work, or to replace equipment that may be worn out or has become obsolete. In the latter connection, one of the first items that comes to mind is motor cars. We are fully equipped with motor cars, but must purchase from 100 to 200 cars each year to replace those which are worn out. During the last ten years, purchases of motor cars have been greatly reduced because of the reduction which has been made in the number of sections, extra gangs and bridge and building gangs on the various roads, which, in turn, released cars that were later reassigned. On our road, this supply of cars has now been exhausted. In the years during which we were practically out of the market, extensive improvements were made in motor cars in the way of greater strength, lightened weight and improved engines, and we now hope to profit by these developments as we again begin to purchase cars.

The same situation prevails in the case of track weed mowers, power wrenches, adzing machines, weed burners, concrete mixers, pumps, air and electric power plants and tools, and welding equipment, although, of course, the number of such units that would be purchased at one time would not be large. Also, while at the present time we have all of the larger units of equipment, such as pile drivers, locomotive cranes and derricks, draglines, air dump cars, etc., to meet our needs, no new units of such equipment have been purchased for several years, and it will not be long now until we will be compelled to begin a replacement program. Furthermore, any enlargement of our maintenance work programs might make additional units necessary.

Several hundred ballast cars of the selective type would be advantageous during the ballast season. These cars are good general-purpose cars, being well adapted for the handling of such commodities as ore and sugar beets, and also coal and gravel where the unloading facilities are suitable. However, the so-called "battleship" type coal car now in general use is a fair ballast car, especially if equipped with proper dumping mechanism, which makes it difficult to justify an increase in cost of about $1,000 for the ballast car as compared with the hopper-type coal car. This differential in price should be reduced substantially.

In the foregoing discussion we have considered principally the replacement of equipment of the types of which we have sufficient for our present requirements, any purchases made generally being for the replacement of worn out and obsolete units. When we consider additional equipment that might be purchased if money were available, I think of ballast scarifiers or discers, and of equipment for smoothing up and surfacing track, such as power jacks and tamping machines, the latter including both the heavier units for use by large gangs, and the smaller, lighter weight units for use by section gangs in spotting up track. We do not have as much of this equipment as we could use to advantage.

More Development Needed

When we begin to give consideration to new equipment as yet not fully developed, its purchase becomes more speculative. In this field I think first of tie renewals, a class of work which consumes a large percentage of the time of our track forces. There has been renewed interest during the last year or two in the development of mechanical aids to this work, but the equipment offered to date has been used largely experimentally and on a few roads, and its merit is not yet proven. When equipment has been developed that will definitely effect a saving in this work, we will fully equip our forces with it.

A spike driving machine is in this same class. The pneumatic machines now offered are cumbersome. Spikes must be set by hand and little if any

The Bridge and Building Forces Would Not Be Overlooked

saving is realized by the use of the machines. A self-contained unit that will eliminate all hand work and do a better and more efficient job at less cost would be most useful, especially in rail relay work.

One of the most important fields for the further development of equipment lies in units that can be used without obstructing the track. Such units are desirable to reduce delays to traffic and to expedite carrying out work by minimizing interference with it caused by traffic. Furthermore, they are becoming imperative as the result of the increasing unreasonable demands being made by train and engine-service employees. These demands, and the upholding of them by the various boards and commissions having authority in these matters, have made it necessary to lay up expensive equipment, the use of which, once fully justified, now results in definitely increased costs. Off-track equipment for use in ditching, widening banks, mowing weeds, the eliminating of weeds in the roadbed, the handling of material, pile driving, etc., that will replace present on-track equipment, will be welcomed by maintenance men, and I am sure that it will find acceptance by all roads.

Because of the limitations imposed by narrow clearances and the limited space in which it must frequently work, equipment for these classes of work lies in a special field. Little, if any, of the efficient equipment which has been developed for highway work is adapted for use under the restrictions imposed in carrying out maintenance of way operations. I am sure that equipment can be designed that will meet our needs. In any event, this situation should challenge the manufacturers, as the demand for this kind of equipment would be large.

Few Roads Have Enough Grinders to Keep Their Rail in Condition

Proven Economies Enlarge Needs

By Engineer Maintenance of Way

AMONG the major industries, the railroads, and especially their maintenance of way departments, have been among the most backward in adapting special tools and equipment for their work. Many seem to be loath to discard "pick-an-shovel" methods of performing work. In recent years it has been demonstrated beyond doubt that these old methods are expensive, and that if the cost of maintenance is to be kept to the minimum, the present trend towards equipping maintenance men with proper tools and equipment to enable them to perform their work at the least possible cost, must be continued until sufficient equipment is provided.

On the road with which I am connected, a good complement of equipment was maintained until 1928, but few purchases were made between 1928 and 1936. As a result, by the latter date, much of the equipment was in none too good condition, and in the light of improvements which had been made in equipment, much of ours was highly inefficient. Furthermore, within this latter period, our demands for modern equipment increased rapidly, due to the increased need for economy. Since 1936, we have maintained a program of spending approximately $50,000 a year for additional equipment and for equipment to replace the obsolete machinery already in service. This amount is not adequate to meet all of our requirements, but the equipment purchased is showing marked results in reducing our cost of doing work. No reduction in labor has been brought about because of the acquisition of this equipment, but with the same track forces, under-maintenance has been checked, and in a number of instances the amount of deferred maintenance accumulated in previous years has been reduced.

Crawler-Mounted Cranes

Because of increased train speeds and the added cost of furnishing train crews for rail-mounted equipment, it is evident that off-track machines should be used in track maintenance, so far as possible. Since drainage and bank widening work had been neglected on our road relatively more than other classes of work, it was important that steps be taken to correct the resulting conditions. Heretofore, steam ditchers, operated in work trains, were used for bank widening work, and ditch drains were opened either manually or by using teams. Work of this nature, where conditions permit, can be done by a crawler crane at a fraction of what it costs by the old methods. Furthermore, new work is being continually developed for such cranes. Since 1936 we have purchased six of these cranes, all equipped with dragline and clamshell buckets with capacities ranging from ½ to ¾ yd. We could use 20 such cranes to advantage on this road.

A number of small gasoline-engine-powered track cranes have been in service on our road for 15 years or more. The first such cranes that we purchased were small and only semi-revolving, and were suited only for handling rail and other track material. Later purchases have been of the larger, full-revolving cranes, which are suitable for a diversity of work, in addition to the handling and laying of rail. Equipped with clamshell buckets, these cranes are used for ditching and banking, especially on branch lines. They are also admirably suited for use with small bridge gangs engaged in repairing and rebuilding timber trestles. On work of the latter character they will do the work of six men handling timbers by hand.

At present our road has 16 of these cranes in service. Five are small and of the semi-revolving type, and should be replaced, while two of the full-revolving type, are worn to such an extent that they should also be removed from service. This leaves a total of nine first-class serviceable cranes. We have need for 25 of these cranes, and 16 should be purchased at this time.

Ballast Discers

We have approximately 900 miles of tracks that have given much trouble with churning, as the result of the ballast becoming fouled quickly with mud. It has been our practice at the worst of these locations to open up drains at the ends of the ties by hand to permit the impounded water to escape. It has been especially necessary to do this before surfacing the track. This method of draining away water impounded under the ties required a large amount of labor. Last spring a ballast discer was purchased to do this work and was placed in service in March. In nine months we drained 450 miles of tracks at an

average cost of $14 a mile. The cost of doing the same work by hand is about $150 per track mile. At least one additional discer is needed to drain properly all of our track that has a tendency to become muddy.

Other items of equipment which we have purchased during the last four years include a tie adzing machine, air compressors (small units for paint gangs), bolt tighteners, power rail drills, portable pneumatic grinders, inspection and section motor cars, power lawn mowers, track mowers, steam pile hammers, paint spraying outfits, and electric and pneumatic wood drills. We need additional units of the types just mentioned and plan to purchase them as conditions permit. In addition, in view of the large amount of labor that is expended each year in removing vegetation and light deposits from ditches through cuts, we are interested in the development of a small tractor grader that will clear trains in cuts, the tractor to be provided with a blade so constructed that vegetation and light deposits can be removed from ditches and disposed of either on the sides of cuts or on the shoulders of the track.

At present we have an investment of approximately $1,300,000 in roadway machines and equipment. I estimate that an additional expenditure of $500,000 would be required to equip our maintenance forces properly. Extending this over five years would require an annual expenditure of $100,000 for new equipment. In addition, an annual expenditure of $50,000 should be made for the replacement of worn out and obsolete equipment, making a total average annual expenditure of $150,000.

Buying Some—Much More Needed

By Chief Engineer

WHAT work equipment would I purchase if I had the money? To answer this question requires consideration of the equipment that I now have in service, the size of our property, the character and volume of the work programmed, and our need for additional units of work equipment. On our lines we are fully equipped with weed burners, weed mowers and ballast discers for we have used such equipment regularly for about 15 years. We have a number of tie tamping outfits, varying from the single self-contained units to the eight-unit machines; a fair complement of power wrenches; several crawler-type draglines; two bull graders; two rail-laying cranes equipped with magnets; a front-end loader; a couple rail end grinders and bevelers; four highway trucks; a number of power augers; one tie adzer; several paint spraying outfits and portable air compressors and, of course, a complete complement of motor cars, push cars, trailers and rail dollies.

Our needs for additional equipment are many and include draglines, bull graders, cranes, rail end grinders, power augers and saws, tie tamping equipment, highway trucks, automatic dump trucks, electric welding generators, ballast scarifiers and shapers, ballast cleaners, power jacks, tie pullers or saws, tie adzers, and probably other units which do not come immediately to mind. During the present year we expect to purchase one dragline, two bull graders, one tie adzer, one bolt tightener, six self-contained, single-unit tie tampers, one power auger and one paint spray. This will exhaust the funds available, but if we had permission to purchase all of the work equipment which we need in order to carry out our work in the most efficient and economical manner, purchases would be greatly increased.

Important Improvements Have Been Made in Tie Tamping Equipment

Specific Further Needs

We have need for considerable work widening and reinforcing embankments, cleaning cuts, opening and straightening ditches and waterways, and other work of this general character; to carry it out we should have two additional draglines, four bull graders, two front-end loaders and probably six automatic dump trucks. For track work, we need four additional tie adzers, one ballast scarifier, two ballast cleaners, two tie saws or pullers, several additional four-tool tie tamping machines, and a large number of self-contained, single-unit tie tampers. All of this equipment is needed to enable us to do more work and to reduce our present labor costs of carrying it out. In addition, we should have two more rail end grinders and two complete electric welding outfits, in order to enable us to maintain desirable rail conditions and to extend the life of our rail.

For our bridge work, we should have two additional cranes for the handling of heavy timbers; at least six power saws and probably four electrically-driven augers, as well as two or three additional paint-spraying outfits and several portable power wrenches. For this same class of work, we should also have three or four additional portable air compressors.

In considering our requirements, we must necessarily give preference, insofar as possible, to off-track equipment. Naturally, certain classes of work must be performed with equipment operating on the rails, but where that is necessary, the equipment used should, whenever practicable, be limited to types that can be removed from the track readily.

Could Make Large Savings

In all of the cases wherein I have indicated the need for additional equipment, cost studies show that the equipment, with reasonable intensity of use, will pay returns varying from 20 to 60 per cent annually, and it is, therefore, economically warranted. When purchasing work equipment, it is important that consideration be given to those types or kinds which can be used a reasonable part of the year, for a return cannot be earned on equipment that is permitted to lie idle.

There is a distinct need for the further mechanization of maintenance work. The necessity for still greater economies in maintenance is becoming increasingly imperative with the loss

of traffic to competing forms of transportation and because of advancing wages, taxes and other costs. Every avenue must be explored and every possible means must be used to make the railroad industry self-sustaining. As every maintenance officer is charged with maintaining his property economically as well as to a safe standard, he cannot overlook the advantages of mechanizing maintenance operations to the fullest extent possible.

High Labor Costs—More Equipment

By Chief Engineer

IF I had the money to buy all of the work equipment that I think I could use to advantage, I would this year buy one power rail layer, designed so it can be set off the track and equipped with a half-yard clamshell bucket for carrying out small ditching operations; one standard spreader dicher; two portable air compressors for bridge gangs; four four-tool air compressors, equipped for tamping track; one concrete mixer of one-yard capacity; two small size, four-cylinder extra gang motor cars for use with extra gangs and to pull track weed mowers; two right-of-way weed mowers of the four-wheel, rubber-tired tractor type, equipped with snow plows for cleaning station platforms; two 30-yd. air dump cars for use with a car-mounted type ditcher; two pipe pushers; one additional power tie adzing machine; eight track motor cars; and a number of power tools, such as concrete busters, jack hammers, power saws, power drills, etc., for our bridge and building gangs.

Actually, I expect to receive authority to buy only a part, maybe a small part, of the above equipment, but I am sure that if I was able to purchase all of it, I could show a nice saving on the investment by getting more and better work done from our present forces, or the same amount of better work with smaller forces.

With conditions on the railroads as they are today, involving steadily mounting labor costs, the need for better track to handle the faster schedules which are being called for almost daily, and with less money to carry out work, it will be necessary for maintenance men to turn more and more to work equipment to secure the high standard of track required by present-day traffic.

Should Equip Section Gangs

While large gangs usually handle the larger operations, only a relatively small part of the total annual maintenance allotment is spent on these operations. By far the larger part is spent on what might be termed "running maintenance," which is handled by section gangs. Some attempt has been made by a few roads to handle practically all maintenance work with large floating gangs, but notwithstanding this, the greater part of running maintenance is and will continue to be handled by the time-honored section gang. For this reason, work equipment suitable for section use and capable of producing much-needed economies in section work should find wide acceptance.

Some equipment for section gang work has already been developed, such as motor cars and small portable ballast tampers. Other equipment, used by small floating gangs in conjunction with section gangs, such as bolt tighteners, track weed mowers and right-of-way weed-mowers, is now available. However, additional equipment that will speed up and improve the quality of section work is still needed. For example, with a large part of the section gang's time spent each year renewing ties, a device that will reduce this time, and yet sell for a reasonable price, should find a tremendous market. Several devices of this nature are already available, but they either cost too much or do not do the work satisfactorily as they should. Some day, somebody is going to make a lot of money out of a device of this kind that really works.

In the future, as labor costs increase and maintenance allotments shrink, more work equipment will be purchased by the railroads as a matter of self preservation, and the manufacturers who best sense and meet the railroads' needs for this equipment are sure to profit to the greatest extent.

Large Economies Stimulate More Purchases

By Chief Maintenance Engineer

MY territory comprises eight divisions, with 2,650 miles of road, 3,300 miles of main tracks, and 4,400 miles of all tracks maintained. If money were available, I would purchase this year a considerable amount of work equipment and power tools for use by the roadway department. One of these purchases would be four eight-tool tie tamping outfits. We purchased six such outfits last year and have been very well pleased with the results secured from them thus far. By the end of the present winter we will have a better idea how power-tamped track holds up, but from indications thus far, there is no question but that our power-tamped track is holding up much better than our hand-tamped track. On much of my territory, owing to conditions with respect to traffic, weather and quality of roadbed, I am not yet convinced that we will be justified in using power tampers, but I am sure that we would be justified in using the four additional outfits referred to above, and feel reasonably certain that if we purchased them, we would want four more.

Some Roads Would Purchase Modern Cranes of Various Types and Capacities

Need Spot-Tampers

In addition to the eight-tool tamping outfits mentioned, I would purchase six four-tool spot-tamping outfits or 24 individual spot tampers for use in territories where the track has been put up by machine. The number of power spot tampers that we will need will increase as the miles of our power-tamped track increase, so that the quality of our spot tamping will be the same as that of our out-of-face tamping.

If money were available, I would purchase one up-to-date weed mowing machine to replace an obsolete machine, and if this machine produced the good results that I expect,

I would feel justified in purchasing additional machines of this type next year.

For use by our rail gangs I would convert two rail laying machines from hand to power operation, and would purchase four adzing machines and four spike pulling machines. I am sure that these machines would pay large dividends on the investment involved. I believe that we could save money by using spike driving machines also in rail laying work, but on this point I am not certain.

Many Roads Want a Suitable Machine to Renew Ties

Among other purchases that I would make would be five grinding outfits, especially for use at our larger terminals in connection with welding work. We have one of these outfits at the present time and it is doing excellent work.

Last year we purchased a 50-hp. tractor equipped with an angle dozer and a sheep-foot roller. This equipment has already almost paid for itself, and I am quite sure that we could use three more such outfits to good advantage. We need off-track machinery for ditching, but I have never seen or heard of any machine on the market which completely meets our requirements.

If we had the money, I would provide a plant for cropping and redrilling rail. We do not have such a plant, and are feeling the need for one more every year. It is true that we have helped our battered rail greatly by building up the ends, but this does not compensate for wear in the fishing area. With a rail cropping plant and with new joints to use with cropped rail, I am sure we could help our track conditions materially.

We have eight bolt tightening machines on our territory, which is a sufficient number to take care of our requirements. We also have 27 gas-welding outfits, which are sufficient to take care of our needs in this field. Our electric welding work, such as repairs to manganese frogs and crossings and in connection with bridge repairs, is performed under contract so that we do not need equipment for work of this nature.

Need B. & B. Equipment

For our other bridge and building work I would purchase four two-gun paint spraying outfits and three sets of rotary brushes and other tools for cleaning steel bridges. We now have four paint spraying outfits and two sets of rotary brushes, but they are not adequate for our requirements. Our present outfits are being used to excellent advantage and are saving a lot of labor. We also have four electric tool outfits, consisting of saws, drills, nut runners, etc., which are proving to be splendid investments for our bridge and building forces. If money were available, I would purchase eight more such outfits immediately so that we could get the full benefit from them during 1940. We are a little short on air compressors and jack hammer drills, and I would, therefore, purchase three 105-ft. air compressors and three jack hammer drills. We need one 20-ton locomotive crane to replace an old machine which has just about played out. We also need a gasoline-operated diaphragm pump for light foundation work.

On our road, where we have a considerable mileage of creosoted ballast-deck trestles, most of these trestles are getting rather old and we will soon be confronted with the necessity for spending a lot of money to replace them. We should purchase a 50-ton locomotive crane with proper steam hammer, and an up-to-date concrete mixing plant with positive control of sand, stone and water, and should begin the construction of concrete ballast deck trestles to replace some of our oldest creosoted structures. In doing this we would, no doubt, reclaim a large amount of serviceable creosoted material which could be used in repairing other creosoted structures. In fact, it would be better to use good serviceable creosoted material released from these old structures for repair purposes than to use new material. Of course, there are many places where we can not use concrete ballast-deck trestles, but, on the other hand, we have so many locations where this construction would prove satisfactory, that I would like to get started on it as soon as possible.

Small Roads Need Equipment Too

By Chief Engineer

WE have a relatively small property, but we plan the purchase of considerable work equipment during 1940 and, if the money were available, could profitably make additional purchases. During the present year we expect to purchase six track motor cars with trailers; two power track jacks for use with ballast gangs; six power-driven tie tampers (single-unit type); one 12-tool air compressor for tamping ties; one multiple-purpose bridge and building machine (with appropriate attachments), consisting of a portable gasoline engine mounted on a wheelbarrow base, with flexible driving shaft; and one portable power saw for use by our line gang. In addition to the above, we should purchase one 10-ton tractor with bulldozer attachment, three moles for cleaning ballast, and one ⅝-yd. gasoline shovel, with dipper, boom and clamshell.

Beyond the equipment already enumerated, we have under consideration the replacement of two 40-ton steam-driven locomotive cranes by two 20-ton Diesel-powered locomotive cranes. Furthermore, if the money were available, we could profitably replace our present spreader with a modern car, and we should purchase ten 50-yd., air-dump cars for ditching operations. In addition, we are studying the advisability of adopting the practice of cutting our wood ties in sections so that they can be removed from the track at less cost than by present methods. If the equipment available for this purpose is to be purchased, we would need three of these machines to start with and, finally, in the event they proved successful, we could probably use a total of six.

Swapping Notes on

Equipment Purchases

Found Valuable

Twenty Maintenance Officers Secure Help From Annual Survey—Three Question Its Value

A DESIRE to know what the other fellow is doing is an inherent characteristic of the human race. Although it may be that at times this desire is based on idle curiosity, more often it arises from a feeling of a community of interests or in the hope of benefitting socially, culturally or professionally from the activities of ones fellows. Likewise, an interchange of information or ideas on matters of mutual interest is valuable, for many minds working together on a common problem will accomplish more than if each were working independently to find the solution.

Recognizing that maintenance of way officers had no medium for the interchange of information relating to the use of work equipment and that this lack made it difficult if not impossible to determine trends in the use of this equipment, *Railway Engineering and Maintenance* undertook two years ago to overcome this handicap by collecting and analyzing information concerning the purchases and use of work equipment. This added service was undertaken in the belief that the information thus presented, and which has been published in the January issue each year, would be of value to maintenance officers in analyzing their own needs and in presenting them to their managements.

To determine the extent to which these officers consider the information, as presented, of value to them, a number were asked to express their reactions to these articles and to say whether they have been or will be of help to them in their consideration of their work-equipment needs. Twenty-three officers replied to these queries, twenty of whom said they found the information of value, while three said that they found it to be of little or no value, one of the latter being opposed to the detailed list of equipment purchases. Abstracts of these replies follow:

I was very much interested in the diversity of equipment listed for the different roads. You have done wonderfully well in gathering together so much valuable information in this subject.—*Chief engineer, large western road.*

This survey of equipment purchases gives us all an idea of the kind of equipment that is being used generally for maintenance work. It is interesting, also, to know how much equipment other roads are purchasing.—*Chief engineer, large southwestern road.*

Shows a Strong Trend

Your survey indicates a strong trend toward the mechanization of maintenance of way forces. I noticed particularly the number of motor trucks purchased. I am of the opinion that with the use of trucks in connection with tractor shovels and draglines, teams can be eliminated to a great extent where they are now used in track construction, bank restoration, and drainage work.—*Chief engineer, important southwestern road.*

This survey should be helpful to maintenance officers in showing the management the type of equipment being generally purchased by other roads. Our principal difficulty in mechanizing is to change our system of maintenance in such a way that it can be handled successfully on a mechanized basis.—*Chief engineer, southern road.*

I always find this article very interesting as I am curious enough to like to know what our neighboring roads are doing. I have found it stimulating when I notice other roads buying work equipment units that we do not have or that we have a very small number of. I find it worth while to check up and make sure that we are not overlooking something here.—*Engineer maintenance of way, large western road.*

I read this tabulation and analysis with a great deal of interest, and found a number of things that enlightened me. In looking over the lists of equipment and the railroads using same, it is interesting and instructive to observe the wide range of equipment purchased by the various roads and thus learn how they carry out their maintenance tasks.—*Chief engineer maintenance, important eastern road.*

These articles are interesting and helpful, as they give us a picture of what the other roads are doing and we are able to benefit from their experience.—*Chief engineer, southwestern road.*

The survey of equipment purchased

in 1939 makes a comprehensive article and indicates that there is some hope for the manufacturers of railway equipment. While our purchases are rather large for the size of our road, they are all small machines. We find it necessary to purchase from eight to fifteen motor cars annually for replacement, but the other machines are small, for use by small gangs.—*Chief engineer, important belt line.*

I find these tabulations interesting in that they give comparable information as to what the various railways listed are doing.—*Chief engineer, large northern road.*

This survey is interesting. I am conversant with the general trend and am consistently endeavoring to acquire more modern equipment. The article aids by calling attention to the trends in the use of work equipment. —*Chief engineer, western road.*

Your surveys of work equipment purchases show how rapidly other railroads are mechanizing maintenance of way equipment in comparison with our own progress. We still have a long way to go, especially with the smaller power tools.—*Chief engineer, western road.*

The survey of work equipment is interesting and will be of benefit in assisting us to build up our equipment budget. I would like to see you continue these articles each year. We will be glad to furnish information the same as in the past.—*Engineer maintenance of way, eastern road.*

The tabulation of maintenance of way equipment purchases by the various railroads, published in your January issue, is not only interesting but informative and I consider it very worth while. We like to know whether we are in line with common practice insofar as various types of equipment are concerned.—*Chief engineer, midwestern road.*

I am particularly interested in your general review of the work equipment situation which quickly gives one the trend that is taking place in this important field, and I also consider the detailed list of the tools purchased extremely valuable. It just so happened that we were considering the purchase of some tools for next year's work, and I used this article to show our management what is taking place on the railroads as a whole and cited this as justification for our going further in the purchase of work equipment than we had generally done. In other words, it gives one an argument that otherwise he could not use or have at his disposal. I hope that you will continue to emphasize the importance and value not only of plenty of work equipment but also the value of keeping it modern and up to date. I know a number of roads that are running motor cars which are so obsolete and expensive that their usefulness is seriously limited. I am sure this applies to other types of work equipment on many railroads. It is extremely important that this type of tool be kept up to the minute and in good physical condition.—*Chief engineer, important eastern road.*

Your survey of work equipment is indeed very interesting and I believe that it will be found of considerable value to maintenance of way officers. *Chief engineer, New England road.*

I have read the article on work equipment purchases with a great deal of interest. It brings to mind the importance of looking around to see what is being done on other railroads and it should result in consideration being given to the use of the various types of equipment where such use can be made to good advantage.—*Chief engineer, midwestern road.*

Should Be Helpful

I have read with interest the article on work equipment and the list of purchases, which indicates the kind of mechanical devices that maintenance men have found to be profitable investments during a period of scarce money, when only essential things could be considered. When asking for authority to acquire such equipment, the article should be helpful in answering the executives question, "Are the best families using them?"—*Chief engineer, southwestern road.*

The survey of work equipment purchases is decidedly a good feature; it enables one to get a clear knowledge of what his neighbors and similarly situated railroads are doing in the use of power machines and furnishes a medium for the exchange of information which is always beneficial in our railroad business. The more information I get on the general situation, the better posted and equipped I feel I am.—*Chief engineer, southern road.*

The Railways Purchased 3,547 Power Machines and Tools in 1939 at a Total Cost of More Than $6,000,000

I read with interest the survey of work equipment. In my opinion the assembling of this information is very beneficial and I trust that it will be continued annually.—*Chief engineer, large eastern road.*

I have reviewed carefully your article on work equipment. The summary is somewhat discouraging in that so many of the units purchased were for replacement. It may be that as a result of the studies being made by the committee on the Wages and Hours problem, and from the testimony at the Washington hearing, there may be developed a greater realization of the economies through mechanization and the necessity for taking advantage of these economies. To date, *Railway Engineering and Maintenance* gives about the only support the maintenance men have had in their efforts toward increased mechanization and it has been, and will continue to be helpful.—*Chief engineer, southern road.*

That part of the article that deals in generalities is of benefit to any one who might be contemplating new equipment, as it gives in a general way definite uses that are being made of such equipment. I do not think it advisable, however, to publish in detail work equipment purchases by the various railroads, for I cannot see that it can be of any particular benefit to any one, and, on the other hand, there is a possibility that such published information might react unfavorably on some roads and also on certain manufacturers.

The equipment purchased by one road will in no way show what is needed on some other road, as the needs of the various companies are different. I can see also where such a list would react unfavorably on maintenance officers if the management notes from this list that they have recommended the purchase of more equipment than was purchased on some other road of greater mileage, without going into detail or investigating what equipment the other road already had or what specific equipment might be needed on their own. I do not see that the publishing of the items purchased by other roads is of any help to me in considering the work equipment needs on my own road.—*Chief engineer, important southern road.*

The narrative portion of the article is very good and will give us some ideas, but I can see no real need for the lists of equipment.—*Assistant chief engineer, large southern road.*

I do not see wherein it is helpful to a road when giving consideration to their work equipment needs.—*Chief engineer, southeastern road.*

New Haven Centralizes

The Brake-Band Riveting Machine in the Shop Also Embodies a Device For Forming Brake Bands to the Proper Curvature

Straightening a Connecting Rod With the Small Hydraulic Press Provided in the Shop for This Purpose

The Shop Includes a Complete Set of Power Tools for Reconditioning Valves. This View Shows the Valve Refacing Machine

While maintaining a divisional organization for exercising supervision over work equipment in the field, the New Haven has established a highly-mechanized central shop, under the jurisdiction of the maintenance of way department, where overhauling and general repairs are made to all of the types of equipment used by this department

AS on other railroads, rapid expansion in the use of maintenance of way work equipment on the New York, New Haven & Hartford in recent years required that careful consideration be given to the problem of maintaining this equipment in the proper condition for efficient and reliable operation. In the beginning, the responsibility for keeping this equipment in repair was placed with the mechanical department, but as the number of types and units in service increased it became clear that their maintenance and repair comprised a highly specialized function, requiring a specially trained organization.

Accordingly, a separate organization was established under the jurisdiction of the engineer maintenance of way and under the direct supervision of the supervisor of welding and equipment, which is charged with the responsibility for maintaining in efficient operating condition practically all units of equipment operated by the maintenance department as well as certain types of equipment assigned to other departments. As a measure of the magnitude of the task assigned to this organization it may be mentioned that it is responsible for the upkeep of a total of approximately 10,000 units of equipment.

The duties of the equipment maintenance department fall naturally into two broad classifications: (1) Those incident to the maintenance and operation of facilities for making shop repairs to the various units and for overhauling them periodically or otherwise as becomes necessary: and (2) those involved in assuring adequate supervision of the machines in the field, including periodic inspections, the making of running repairs and the selection and thorough training of machine operators.

To discharge those duties falling under the first classification, a central repair shop serving the entire system has been established at New Haven, Conn. Although the New Haven has about 2,000 miles of lines, they are embodied in a relatively compact network in which the most remote point is only slightly more than 150 miles from New Haven. Hence, because of the relatively short distances involved, it is entirely practicable to ship work equipment from any point on the railroad to a central location for repairs, and it was natural that the railroad should elect to establish a central repair shop rather than a number of smaller shops at different points. The equipment and organization embodied in the repair shop are described at another point in this article.

Field Organization

The field organization maintained by the equipment maintenance department for discharging those responsibilities falling under the second classification mentioned above is built largely around employees designated as gas engine mechanics, of which from one to three are assigned to each division, depending on the amount of equipment to be maintained. While these mechanics are division employees and report to the respective division engineers, they are under the direct supervision of the engineer of welding and equipment. They are responsible for maintaining the proper field supervision of all types of mechanical equipment used by the maintenance forces.

The gas engine mechanics are each supplied with a small number of spare carburetor and magneto parts, spark plugs, etc., and are available at all times for the making of running or emergency repairs to any of the equipment under their jurisdiction. If the repairs are such as to necessitate the shopping of the equipment, the mechanic arranges to have the unit shipped to the central shop, preceding it with a report of its condition, which includes a list of the parts required. The latter expedient allows the shop time to obtain the needed parts while

the Repair of Its Work Equipment

the machine is in transit, thus precluding the necessity of maintaining on hand a large supply of spare parts. This policy, incidentally, is followed generally, regardless of whether the machine is sent to the shop for specific repairs or for routine overhauling.

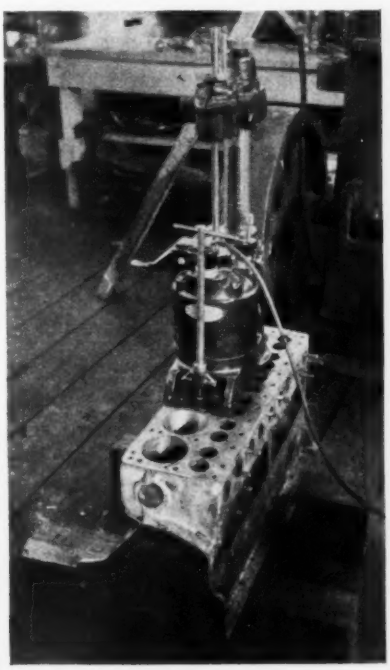
Supervision over those units of equipment that are in more or less constant use throughout the year, such as track motor cars and motor trucks, is maintained through periodic inspections which are made for the purpose of determining the general condition of the unit, whether any immediate repairs are required, and if it is receiving the proper care on the part of the operator. Any running repairs or adjustments required are made at the time, and if the inspection discloses the presence of defects requiring shop attention, arrangements are made to forward the unit to the central shop.

All machines that are used on a seasonal basis, such as tie-tamping equipment, ballast-cleaning machines and rail grinders, are sent into the shop for overhauling at the close of the working season, and in each case they are inspected by the gas engine mechanic before being sent to the shop. On the basis of this inspection, the mechanic submits a report describing the condition of the unit and including a list of the repair parts needed, a description of any work performed in the field, and an account of any difficulties encountered in the operation of the machine. An attempt is made to inspect periodically equipment that is overhauled annually and, in addition, as opportunity presents itself the general condition of the equipment is noted by supervisory officers or by the gas engine mechanics.

Training of Mechanics

Because of the nature of their duties and the responsibilities attached to them, the gas engine mechanics obviously must be highly-trained individuals with a well-rounded background of experience with the different types of mechanical equipment used by the maintenance department. It is only natural, therefore, that such employees should be recruited for the most part from among the mechanics in the central repair shop, who are encouraged to qualify for the field positions by obtaining a diversified experience.

To a large extent, work equipment operators are also recruited from among employees in the repair shop, and whenever possible they are given the opportunity of working in the shop during the winter, thereby making it possible for them to gain further experience and assuring the railroad of a supply of experienced operators at the start of the working season. Each operator is supplied with a manufacturers' instruction book pertaining to the particular type of equipment under his care and, to insure



Left—General View of the Interior of the New Haven's Work Equipment Repair Shop at New Haven. Above—One of the Two Cylinder Boring Bars, Included in the Shop Equipment

that equipment will be properly lubricated, each operator is provided with a lubrication chart showing the proper lubricant for each type and make of equipment. Obviously, candidates for operator's positions must have a measure of mechanical ability and experience, and in each case they are required to demonstrate their ability to operate the particular unit of equipment satisfactorily.

As regards the heavier units of equipment, such as cranes, ditchers and spreaders, the gas engine mechanics are assisted by employees designated as work equipment mechanics, there being two employees of this designation on the railroad. In the beginning the two work equipment mechanics handled practically all work in connection with the maintenance of these larger units, but the increase that has occurred in the number of such units and a recent program that the road has carried out for converting steam machines to gasoline or Diesel operations have made it advisable to assign some of this work to the gas engine mechanics.

The duties of the work equipment mechanics are similar to those of the gas engine mechanics, their function being to make periodic inspections of the machines under their jurisdiction and to supervise and assist in making field repairs. The operators or engineers of these larger units, who must necessarily possess considerably more mechanical ability and experience than is required by operators of the smaller and less complicated pieces of equipment, are qualified to make heavy repairs and replacements in the field, in which work they are frequently assisted by a mechanic from the shop.

Overhauling Compressors

As noted previously, practically all units of equipment whose use is confined to the working season, are sent to the ceneral shop for a general check-up and overhauling in the fall, regardless of their condition. In undertaking work on such equipment in the shop, engines and compressors are first subjected to operating tests, on the basis of which any necessary adjustments or repairs are made. The overhauling routine also involves the making of any necessary replacements or repairs to brakes and rigging, frames, wheels, and timber and other parts. Finally, when each unit has been thoroughly overhauled, it is again subjected to appropriate tests and test runs, and it is pronounced in condition for further active service only after it has demonstrated its ability to conform to rigid standards of operation and performance.

A few examples will serve to illustrate the procedures employed in overhauling various types of equipment. When the shop is ready to undertake the work of overhauling tie-tamper compressors, two machines are selected and, after test runs, are dismantled and the necessary repair parts are listed. These parts are then ordered from the manufacturer and,

This View Shows a Number of Motor Cars and Compressors in Various Stages of Repair. Machine Shop in Left Background

while awaiting their arrival, the shop mechanics proceed with the dismantling of two additional units. This illustrates another of the expedients that are employed to preclude the necessity of keeping a large number of repair parts on hand. When each compressor has been repaired and reassembled, it is given a final shop test involving a 48-hr. test run, during which the fuel consumption, ignition and timing, governor control and other features are checked carefully.

Before any repair work is undertaken on pneumatic tamping guns they are tested for air consumption, and on the basis of this test they are segregated into two groups, depending on whether the consumption of air is within permissible limits or is excessive. Those in the latter group that require only adjustment or that can be corrected by the insertion of slightly larger pistons, are repaired in the shop; others are sent to a private concern to have their cylinders built-up.

Tie-tamping generators are handled at the shop in much the same manner as the compressors. When repairs to such units and their power plants have been completed, they are likewise subjected to a rigorous test, in which they are operated continuously eight hours daily for two or three days, the load being supplied by tamping guns arranged in a rack. In addition to tie-tamper compressors and generators and the tamping tools, other equipment that is overhauled annually at the shop includes rail grinders, power adzing machines, bolt tighteners, Mole ballast cleaners, pneumatic spike drivers and weed burners.

How Motor Cars Are Handled

As already mentioned, such units as motor cars and motor trucks are inspected periodically in the field and are brought into the shop only when these inspections indicate the need for general repairs. Generally the policy is to inspect motor cars three or four times annually, depending somewhat on the mileage which they are operated. When the condition of the car reaches the point where a general overhauling is required, the gas engine mechanic arranges to ship it to the shop, preceding it, of course, with a list of the parts required. To the end that the load in the shop will be spread as evenly as possible over the year, an attempt is made to concentrate shop work on motor cars during the summer months.

When overhauling a motor car in the shop, the first operation is to remove the motor from the chassis and check it for defects, after which any needed repairs are made. When these have been completed, the unit is placed in a motor stand and its operation subjected to careful observation. In the meantime any necessary repairs are made to the chassis and the frame, and when these have been completed the motor is returned to the chassis and the car is taken out on the track for test runs.

Motor Trucks

Motor trucks comprise an essential type of maintenance work equipment on the New Haven, being used extensively for the transportation of track and bridge gangs. Including the automobiles and trucks assigned to other departments, there are a total of 182 automotive units in service on the road. As part of the program for keeping these units in repair, each truck or automobile is inspected by the division gas engine mechanic at intervals of 2,000 miles of travel. During this inspection careful attention is given to the brakes, the bearings, the steering gear, and the ignition, and the front wheels are checked for alinement. Any minor defects revealed by this inspection are corrected at once, and if replacement parts are required the mechanic obtains authorization from the supervisor of welding and equipment to

obtain an emergency order from the purchasing department giving him authority to purchase the parts locally.

Moreover, if the inspection, which is made in the presence of the operator, should reveal the existence of relatively severe defects, such as loss of compression, or a knock, or unduly large consumption of oil, the mechanic has authority to order the truck sent into the shop for repairs. As a general rule the trucks are shipped to the shop for a general check-up and overhauling at the end of each 24,000 miles of travel, although this rule is necessarily not subject to strict application.

At the shop one each of the common types of engines is retained as a spare, the engine being complete including the clutch, and when a truck is sent to the shop requiring overhauling of the motor the old engine is removed and the spare engine installed. With this policy the truck is ready for service in 24 hrs. The engine that was removed from the truck is then overhauled and made ready for the next replacement.

Generally speaking, an effort is made to inspect the larger pieces of equipment, such as cranes, ditchers and spreaders, about once a month. When these inspections indicate that the machine is in need of general repairs, it is sent to the maintenance equipment repair shop if Class C repairs are indicated, or to a mechanical department shop if Class A or Class B repairs are required.

Showing the Portion of the Shop Where Tie-Tamper Guns Are Tested and Repaired

Shop Facilities

The central shop facilities are housed in a steel and brick structure at New Haven that was built originally as a car repair shop. The structure consists of a high bay, 70 ft. by 400 ft. in plan, not including space at the north end devoted to offices and facilities for employees, and a low or side bay of approximately the same dimensions. The more important repair facilities and operations are housed in the high bay, which is served by a 10-ton overhead traveling crane and also by three tracks which project into the structure from the south end. The side bay also contains certain repair facilities and is devoted partly to garage space.

For the most part, the repair facilities are arranged in the northerly portion of the high bay and include a testing and drafting room, a machine shop, a welding and blacksmith shop, a carpenter shop and a paint shop, all of which are arranged along the westerly wall of the structure. In addition, floor space is set aside in the low bay for the testing and repair of tie-tamper guns (both air and electric) and of air hose and pipe lines. Other departments incorporated in the shop, which are not directly related to the repair of work equipment, include a track-scale repair shop and a shop devoted to the repair of electric trucks.

Testing Devices

The use of various testing devices as a means of detecting defects and of assuring accuracy in the adjustment of gasoline engines and generators has been deemed of particular importance, and the testing room is supplied with a full complement of such units. These include a four-way condenser tester, a winding tester for checking magnetos and coils, a synchronizing light for checking the timing of motors, a voltage regulator for measuring the output of generators, and a connecting rod aliner for determining if cylinders and connecting rods are square with their wrist pins.

The shop equipment includes a complete set of power tools for reconditioning valves and valve seats and for reboring cylinders. Included in the former group are a valve refacer, a valve-seat regrinder and a power valve-seat inserter. Two portable cylinder reboring machines or bars of different sizes are provided, the larger being for use in reboring the cylinders of compressors and similar units, and the other being for use with smaller motors.

All departments of the shop—that is, the machine, wood-working, blacksmith and paint shops—are completely equipped with modern power tools and devices. Miscellaneous equipment not embodied in any of these departments includes battery testing and charging apparatus, a brake-band riveter, equipment for repairing automobile inner tubes, a metal washing tank, a stand for testing gasoline motors, a portable crane, and a hydrostatic unit for testing the soundness of pressure tanks. Among the latest additions to the shop equipment are a motor assembly stand in which motors can be readily turned to any desired position when undergoing repair or adjustment, and a sail-makers sewing machine for stitching canvas tarpaulins, motor car curtains and canopies for motor trucks. Portable electrically-powered tools in use at the shop include four drills, two saws, two nut runners, two screw drivers and a hand tool for cutting sheet metal.

Shop Organization

The repair shop is under the general direction of the supervisor of welding and equipment and under the direct supervision of a general foreman. Exclusive of employees connected with the scale shop, the shop organization currently includes three gas-engine mechanics, who are engaged principally in the repair of motor cars and compressors; two work-equipment mechanics, who are assigned to the heavier units such as cranes and shovels; two automobile mechanics; one Diesel and automobile mechanic; four machinists; two millwright mechanics; one helper-welder; twelve mechanic's helpers; one painter; one crane operator; one electric vehicle mechanic; one magneto and general repairman; one sheet metal worker; two body builders; and two laborers.

Because of the relatively large number of different types of equipment handled in the shop, new additions to the personnel, since they are ultimately expected to be advanced to the grade of mechanic, must obviously possess a considerable degree of mechanical skill and native ability in this direction. They are, therefore, chosen with care and are first introduced into the shop as laborers. While in this capacity, they are observed closely for evidences of ability and interest in the work, and, if their record justifies, they are eventually given "trouble-shooting" jobs. If their performance under such circumstances is considered satisfactory, they are given the rating of a helper at the first opportunity, further promotion to the grade of mechanic being made when they have demonstrated their ability to cope with any mechanical problems that are likely to arise in the shop.

A.R.E.A. to Consecutive in

Wide variety of subjects will be covered in reports of 27 standing and special committees as association meets in three-day session, March 12-14

American Railway Engineering Association
59 EAST VAN BUREN STREET
CHICAGO

February 28, 1940

To the Readers of
Railway Engineering and Maintenance

I extend an invitation to each of you to attend the 41st annual convention of the American Railway Engineering Association at the Palmer House, Chicago, on March 12-14. At this convention, 27 committees will present reports on more than 100 different subjects dealing directly with current problems in railway engineering and maintenance work.

Supplementing these reports, C. H. Buford, newly elected vice-president, Operations and Maintenance Department, Association of American Railroads, will address our members at the opening session on Tuesday forenoon.

I invite you also to attend our annual luncheon on Wednesday noon at which Judge R. V. Fletcher, vice-president and general counsel, Association of American Railroads will address us on The Outlook for Railroad Legislation.

To provide for your maximum convenience, we have so arranged our program as to bring into the same session reports on related topics. Thus, five reports dealing with Track will be presented at the session on Wednesday forenoon while Wednesday afternoon will be given over to the report of the Committee on Rail, together with Dr. A. N. Talbot's report of our Special Committee on Stresses in Railroad Track and H. F. Moore's report on Transverse Fissures. Similarly, reports dealing with Bridges will be presented at the session on Thursday afternoon.

The program of this convention will comprise a cross section of current developments in engineering and maintenance of way practices. As such, it will afford you an opportunity to keep up to date in this period of rapid change. I hope that you will accept this invitation.

Yours sincerely,

E. M. Hastings
President

E. M. Hastings
President

THE forty-first annual convention of the American Railway Engineering Association will be held in Chicago on March 12-14, climaxing another year of association activities. As for a number of years, the Palmer House will be the convention headquarters.

Study Many Problems

Acting principally through its 27 standing and special committees, the association has again maintained its record of intensive activity, giving consideration to more than 100 subjects covering a wide range of the every-day and special problems confronting engineering and maintenance of way officers. In this committee work, the association has brought together the knowledge and experience of approximately 850 of its more than 1900 members, representing practically every railway in the United States and Canada.

Particularly in view of the generally increased speed of train operation in recent years, with the greater demands which this is making upon the track and structures, coupled with the demands for increased efficiency and economy in every class of maintenance work, it is expected that the convention this year will take on increased significance. This will be further intensified by the indications that railway traffic and earnings in 1940 will be the largest since 1937, with the increased activity which this will bring in every phase of roadway and structures work.

The reports to be presented this year will deal with such practical problems as the destruction of termites and their prevention; the use of asphalt in ballast; specifications for laying rails; the cause and control of the

Hold 41st Convention Chicago

splitting of crossties; fastenings for timber structures; rejuvenating deep wells; track welding equipment; and the effect of modern equipment and machines on bridge organization and efficiency. Reflecting the trend toward higher train speeds and greater economies, reports will also be presented dealing with the effect of high speed on railway operating expenses; the effect of speeds in excess of 75 miles an hour on the economics of railway location; spirals for high-speed operation; and on many other subjects equally as important.

Intensive Program

In accordance with the usual custom, the convention will convene on Tuesday morning, and will continue through Thursday. Two general sessions will be held each day, and, as indicated in the accompanying program, related subjects, insofar as possible, will be considered at the different sessions, an arrangement adopted to meet the convenience of those with special interests who may find it impossible to attend all of the sessions.

Special features of the program will include an address at the opening session by C. H. Buford, vice-president, Operations and Maintenance department of the Association of American Railroads; an address by R. V. Fletcher, vice-president and general counsel, Association of American Railroads, at the association luncheon on Wednesday, on The Outlook for Railroad Legislation; and the joint meeting of the association with the Western Railway Club on Wednesday evening. At this latter meeting, which will be the fifth consecutive meeting of its kind, Philip Harrington, commissioner of the Department of Subways and Super-highways, Chicago, will discuss The Chicago Subway. This meeting, which will be held at the Hotel Sherman, will be preceded by a reception in the mezzanine and Club room at 6 p.m., and dinner in the Grand Ballroom at 7 p.m.

Program

41st Annual Convention

Palmer House, Chicago

Tuesday, March 12

Morning Session—9:45 A.M.

Convention called to order
President's address—E. M. Hastings
Address by C. H. Buford, vice-president, Operations and Maintenance department, A.A.R.
Reports of the Secretary and the Treasurer
Reports of committees on
- Standardization
- Signals and Interlocking
- Electricity
- Economics of Railway Location and Operation

Afternoon Session—2 P.M.

Reports of committees on
- Highways
- Rules and Organization
- Clearances
- Waterways and Harbors
- Uniform General Contract Forms

Adjournment at 4 p.m. for visit to the exhibit of the National Railway Appliances Association at the International Amphitheatre

Wednesday, March 13

Morning Session—9 A.M.

Reports of committees on
- Economics of Railway Labor
- Ties
- Wood Preservation
- Roadway and Ballast
- Track

Association Luncheon, 12 o'clock

Address by Judge R. V. Fletcher, vice-president and general counsel, Association of American Railroads, on "The Outlook for Railroad Legislation"

Afternoon Session—2:30 P.M.

Reports of committees on
- Complete Roadway and Track Structure
- Rail
- Stresses in Railroad Track

Evening—6 o'clock

Joint meeting and dinner with the Western Railway Club at the Hotel Sherman. Address by Philip Harrington, Commissioner of the Department of Subways and Superhighways, City of Chicago, on "The Chicago Subway"

Thursday, March 14

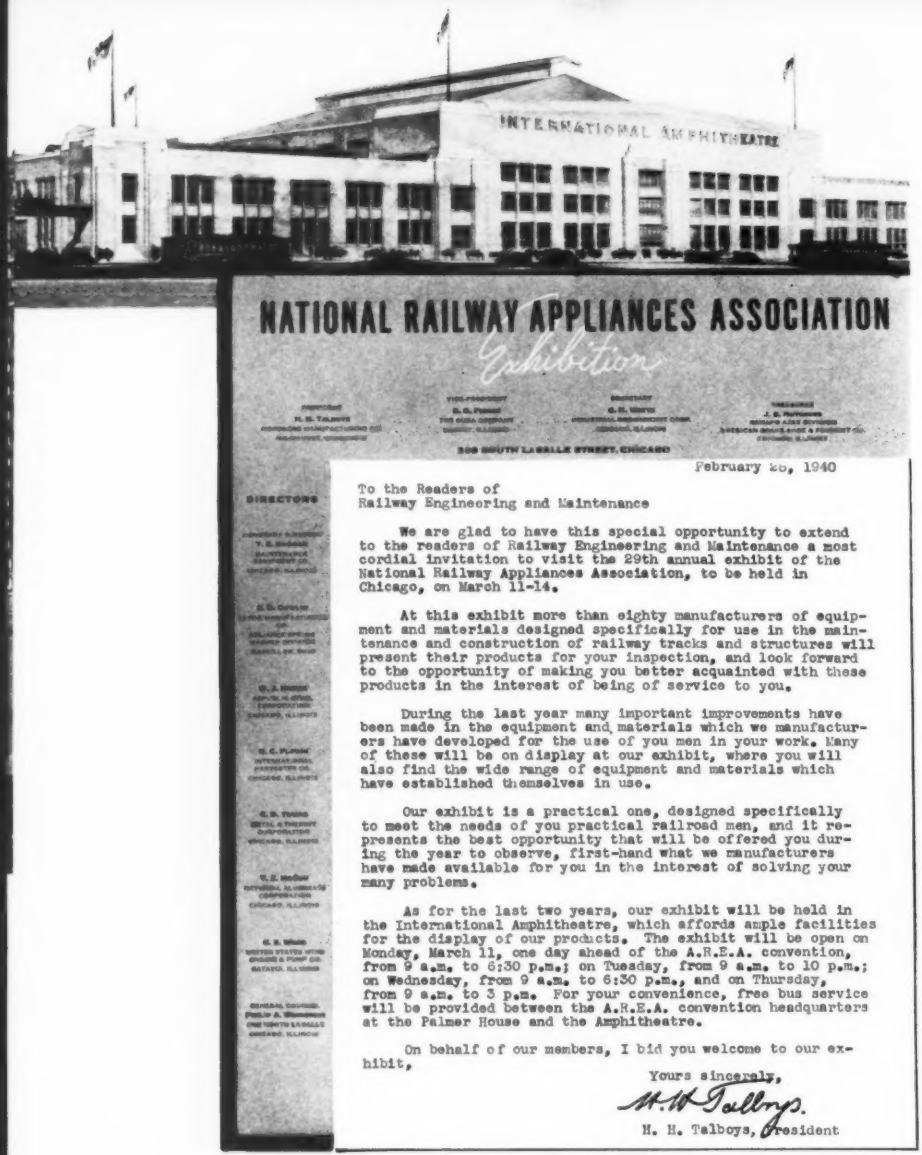
Morning Session—9 A.M.

Reports of committees on
- Buildings
- Water Service, Fire Protection and Sanitation
- Yards and Terminals
- Records and Accounts
- Maintenance of Way Work Equipment
- Iron and Steel Structures

Afternoon Session—2 P.M.

Reports of committees on
- Masonry
- Wood Bridges and Trestles
- Impact
- Waterproofing of Railway Structures

Closing Business


INTERNATIONAL AMPHITHEATRE
NATIONAL RAILWAY APPLIANCES ASSOCIATION
Exhibition
308 SOUTH LA SALLE STREET, CHICAGO
February 20, 1940
DIRECTORS
To the Readers of
Railway Engineering and Maintenance
We are glad to have this special opportunity to extend to the readers of Railway Engineering and Maintenance a most cordial invitation to visit the 29th annual exhibit of the National Railway Appliances Association, to be held in Chicago, on March 11-14.
At this exhibit more than eighty manufacturers of equipment and materials designed specifically for use in the maintenance and construction of railway tracks and structures will present their products for your inspection, and look forward to the opportunity of making you better acquainted with these products in the interest of being of service to you.
During the last year many important improvements have been made in the equipment and materials which we manufacturers have developed for the use of you men in your work. Many of these will be on display at our exhibit, where you will also find the wide range of equipment and materials which have established themselves in use.
Our exhibit is a practical one, designed specifically to meet the needs of you practical railroad men, and it represents the best opportunity that will be offered you during the year to observe, first-hand what we manufacturers have made available for you in the interest of solving your many problems.
As for the last two years, our exhibit will be held in the International Amphitheatre, which affords ample facilities for the display of our products. The exhibit will be open on Monday, March 11, one day ahead of the A.R.E.A. convention, from 9 a.m. to 6:30 p.m.; on Tuesday, from 9 a.m. to 10 p.m.; on Wednesday, from 9 a.m. to 6:30 p.m., and on Thursday, from 9 a.m. to 3 p.m. For your convenience, free bus service will be provided between the A.R.E.A. convention headquarters at the Palmer House and the Amphitheatre.
On behalf of our members, I bid you welcome to our exhibit,
Yours sincerely,
H. H. Talboys
H. H. Talboys, President

Equipment Exhibit

National Railway Appliances Association to present twenty-ninth exhibit at the International Amphitheatre, Chicago, March, 11-14

H. H. Talboys
President

Manufacturers to Show Latest Developments in Products of Interest to Engineering and Maintenance Officers

WITH brighter prospects for larger purchases of work equipment, power tools and materials by the railways for construction and maintenance of way purposes during 1940, members of the National Railway Appliances Association are looking forward with enthusiasm to the twenty-ninth annual exhibit of their association to be held coincident with the convention of the American Railway Engineering Association, in Chicago on March 11 to 14, inclusive. Already, with 80 manufacturers arranging to participate, including a number of companies that have not exhibited heretofore, the exhibit this year promises to be larger and more informative than that of last year.

As set forth in the above letter from H. H. Talboys, president of the National Railway Appliances Association, railway officers attending the convention of the A.R.E.A. are cordially invited to visit the exhibit. As for the last two years, the exhibit will be held in the large and attractive International Amphitheatre, and the association will provide continuous bus service between the convention hotel (the Palmer House) and the Amphitheatre during the exhibiting hours for the convenience of those who will attend.

The exhibit will be open to visitors during four days, beginning on Monday, March 11, one day ahead of the A.R.E.A. convention, the extra day being provided to afford railway men maximum opportunity to study the individual exhibits without encroaching upon their convention activities. The specific exhibiting hours for each of the days are as follows:

Monday,	March 11—	9:00 a.m.	to	6:30 p.m.
Tuesday,	March 12—	9:00 a.m.	to	10:00 p.m.
Wednesday,	March 13—	9:00 a.m.	to	6:30 p.m.
Thursday,	March 14—	9:00 a.m.	to	3:00 p.m.

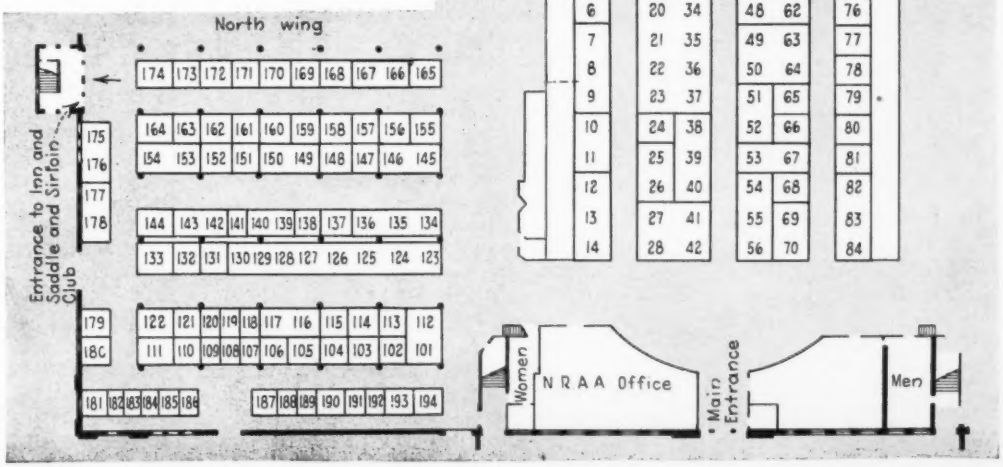
The exhibit this year is being directed by H. H. Talboys (Nordberg Manufacturing Company), as president of the association, and C. H. White (Industrial Brownhoist Corporation), secretary. A list of companies that will

and Materials at Chicago

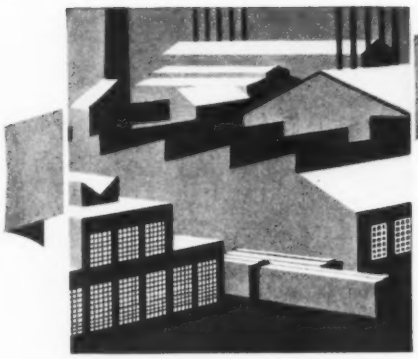
participate in the exhibit, and their booth numbers is presented herewith, together with a floor plan of the International Amphitheatre showing the various exhibit spaces and their respective numbers.

Exhibiting Members

Adams & Westlake Company, Chicago..... 29
Air Reduction Sales Company, New York.....10-11
Alcoma Railway Equipments, Chicago.....171
American Car & Foundry Company, New York.....175-176
American Fork & Hoe Company, Cleveland, Ohio.....174
American Hoist & Derrick Company, Minneapolis, Minn..... 19
Ardco Manufacturing Company, Hoboken, N. J.....165A
Armco Railroad Sales Company, Middletown, Ohio..... 6
Barco Manufacturing Company, Chicago..... 15
Broderick & Bascom Rope Company, St. Louis, Mo..... 1
Buda Company, Harvey, Ill.....27-28-41-42
Chicago Pneumatic Tool Company, New York..... 17
Chipman Chemical Company, Bound Brook, N. J..... 5
Crerar, Adams & Company, Chicago..... 80
Cullen-Friestedt Company, Chicago..... 81
Dearborn Chemical Company, Chicago.....38-39-40
DeSanno & Son, Inc., A. P., Philadelphia, Pa.....131
Dickinson, Inc., Paul, Chicago.....113
Dimick-Mosher Products Company, Boston, Mass.....172
Duff-Norton Mfg. Company, Pittsburgh, Pa.....32-33
Eagle Grinding Wheel Company, Chicago.....120
Eaton Manufacturing Co. (Spring Washer Div.), Massillon, Ohio 31
Elastic Rail Spike Corporation, New York..... 4
Electric Tamper & Equipment Co., Ludington, Mich.....101-112
Fairbanks, More & Co., Chicago.....20-21-22-23-34-35-36-37
Fairmont Railways Motors, Inc., Fairmont, Minn.....
.....43-44-45-46-47-57-58-59-60-61
Fulton Asphalt Company, Chicago.....173
Gary Screw & Bolt Company, Pittsburgh, Pa.....114
General Electric Company, Schenectady, N. Y.....153-154
Hayes Track Appliance Company, Richmond, Ind.....133
Hogan, George M., Chicago.....166-167
Homelite Corporation, Port Chester, N. Y.....144
Hubbard & Company, Pittsburgh, Pa..... 66
Industrial Brownhoist Corporation, Bay City, Mich..... 30
Ingersoll-Rand Company, New York.....134-135-136
International Harvester Company, Chicago.....149-150
Jacobsen Manufacturing Company, Racine, Wis.....115
Johns-Manville, New York.....12-13-14
Jordan Company, O. F., East Chicago, Ind..... 77
Kalamazoo Railway Supply Co., Kalamazoo, Mich.....53-67
Lehon Company, Chicago.....152
Lewis Bolt & Nut Co., Minneapolis, Minn.....148
Loftus & Son, La Crosse, Wisc.....163
Lundie Engineering Corporation, New York.....137
Maintenance Equipment Company, Chicago.....49-50-63-64
Mall Tool Company, Chicago.....145-146
Master Builders Company, Cleveland, Ohio.....138
Metal & Thermit Corp., New York.....51-52
Morden Frog & Crossing Works, Chicago.....25-26
Morrison Railway Supply Corp., Buffalo, N.Y.....122
Moto-Mower Company, Chicago.....147
National Aluminate Company, Chicago.....7-8-9
National Carbide Corporation, New York.....10-11
National Lead Company, New York.....141
National Lock Washer Company, Newark, N. J..... 79
Nichols, Geo. P. & Bros., Inc., Chicago.....162
Nordberg Manufacturing Co., Milwaukee, Wis.....
.....123-124-125-126-127-128-129-130
Oxweld Railroad Service Co., Chicago.....87-88
Pettibone Mulliken Company, Chicago.....69-70
Philadelphia Steel & Wire Corp., Philadelphia, Pa.....132
Pocket List of Railroad Officials, New York.....155
Power Ballaster Co., Chicago.....168
Rail Joint Company, The, New York.....48-62
Railroad Accessories Corporation, New York.....142-143
Rails Company, New Haven, Conn..... 16
Railway Engineering and Maintenance, Chicago..... 65
Railway Purchase and Stores, Chicago.....151
Railway Track-Work Co., Philadelphia, Pa..... 78
Ramapo Ajax Division, American Brake Shoe & Foundry Co., New York.....54-55-56
Reade Manufacturing Company, Jersey City, N. J.....165
Republic Steel Corporation, Cleveland, Ohio.....82-83-84
Schramm Inc., West Chester, Pa.....158
Sperry Products, Inc., Hoboken, N. J.....164
Syntron Company, Homer City, Pa.....116-117
Teleweld, Inc., Chicago.....156
Templeton, Kenly & Co., Chicago..... 24
Timber Engineering Company, Washington, D. C.....118
United States Wind Engine & Pump Co., Batavia, Ill..... 68
Wilson Welder & Metals Co., Inc., North Bergen, N. J.....10-11
Woodings-Verona Tools Works, Verona, Pa.....177-178
Woolery Machine Company, Minneapolis, Minn.....139-140



Floor Plan of the Exhibit



PRODUCTS of Manufacturers

Rubber Cushion Wheels For Track Motor Cars

AFTER several years of exhaustive research and practical tests under all weather conditions, Fairmont Railway Motors, Inc., Fairmont, Minn., has developed a rubber cushion wheel for railway motor cars which is said to provide exceptional riding qualities without sacrificing strength, safety or durability.

Available in 14-in. and 16-in. tread diameters, the new wheel is provided with a vulcanized non-skid rubber tread 9/16 in. thick and 3 in. wide, molded and bonded directly to a 3/16-in. steel plate rim by a process which combines the two materials as a complete unit. The steel flanged rim is so designed that either side can be bolted to the wheel flange. The head is accurately positioned on the flange unit by a machined centering shoulder and is held securely by eight heat-

The Rubber Covered Motor Car Wheel

treated, fine thread bolts. The flange and spoke unit is bolted securely to the wheel hub, which is of the identical type used with standard Fairmont 14-in. and 16-in. demountable wheels. These rubber cushion wheels can be applied to cars now in service, which have 14-in or 16-in. demountable rims, without removing the hubs from the axles.

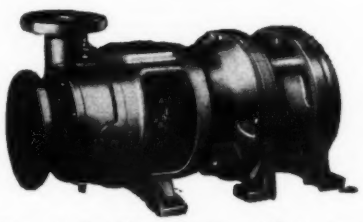
When rubber cushion wheels are used, new four-wheel brakes comprising renewable, concave, cast-iron faced shoes operating on the flanges of the wheels are required. It is declared that quick, smooth stops can be made with ease and safety and that the new wheels provide greater traction, even when rails are wet or icy. Among the advantages claimed for the new wheels are an estimated life of about 20,000 miles and low replacement costs, since it is only the rubber-covered, steel-backed treads that must be renewed. The tread unit can be unbolted easily, thus making renewals simple as well as economical.

Improvements in Cameron Motorpumps

THE Ingersoll-Rand Company, New York, has recently added a 5-in. pump with capacities up to 1400 gal. per min., and which will develop total heads up to approximately 120 ft., to its line of Cameron Motorpumps, which formerly covered a range from 5 to 1,000 gal. per min., and developed heads up to 500 ft. In addition, this company has made a number of improvements in the design and construction of its complete line of motorpumps.

The Cameron motorpumps are self-contained, compact units consisting of a horizontal, centrifugal, electrically operated pump and a built-in electric motor, with the pump impeller and driving motor rotor mounted on one oversized steel shaft. The pumps are of the enclosed impeller type, either single or two-stage, with hydraulically balanced bronze impellers and may be obtained with various motor combinations for various type of electric current. The shaft is mounted on oversized ball bearings. Other features are renewable bronze wearing rings and shaft sleeve and one stuffing box, which is easily accessible.

Improvements recently added to these motorpumps include a milled slot in the shaft back of the shaft sleeve which greatly facilitates the removal of the impeller and shaft sleeve by use of a yoke in the slot, placing



One of the New Cameron Motorpumps

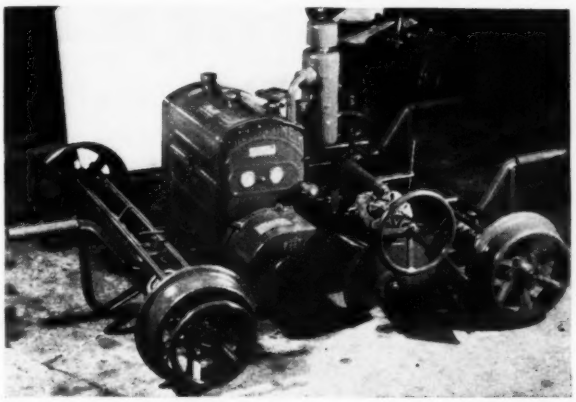
the stuffing box gland back of the yoke and then drawing up the stuffing box gland bolts. Another improvement consists of a special packing arrangement to insure against leakage underneath the shaft sleeve, in which a steel follower compresses the packing at the same time that the shaft nut is tightened up on the impeller. A gasket is also provided on the outside diameter of the steel follower to make this a double sealed joint. An additional feature is a new and larger shaft nut, which greatly reduces the possibility of shaft breakage due to excessive wrench pressure.

Four-Wheel Rail Grinder

THE Mall Tool Company, Chicago, has produced a new four wheel, heavy duty, rail grinder, which incorporates a number of exclusive features, and a new roller guide accessory for grinding overflow metal or lip from stock rails and switch points.

This grinder is powered with a four-cylinder, water-cooled gasoline engine, with a battery ignition. Dust and grit are kept away from the engine by locating the grinding wheel so that the sparks and grit are thrown away from the engine and by

providing a large air cleaner above the engine. Vertical control of the grinding wheel is provided by a screw and toggle feed, which allows the use of two heavy springs to hold all parts in compression and eliminate lost motion due to wear. Transverse motion of the grinding wheel is accomplished by sliding the axles through a tubular frame in an oil bath. The machine is equipped with rail skids and a built-in turntable, which permits it to be rotated completely on the track or to be turned 90 deg. for easy removal from the track.



The New Mall Four-Wheel Heavy-Duty Track Grinder

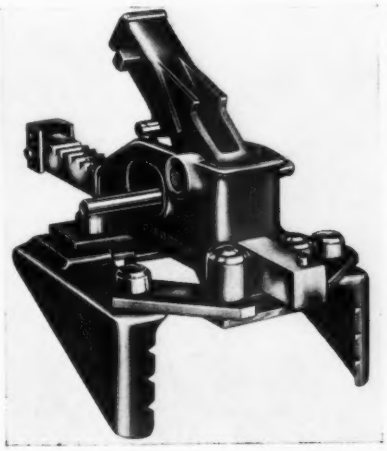
The roller guide accessory is a cup-type of grinding wheel equipped with a roller which operates on the surface of the stock rail or switch point. This guide is designed specially for use in grinding off the lip or overflow metal on the sides of switch points and stock rails. It is said that it can be operated easily by any track man, and that its use permits this type of grinding to be performed with more uniformity and less gouging.

Duff-Norton Tie Puller

THE Duff-Norton Manufacturing Company, Pittsburgh, Pa., has developed a tie puller for use in tie renewal work, which is simple in construction and does not foul the track when in use.

This tie puller is essentially a horizontal rachet jack, with an adjustable base which grips the tie on each side. The base operates on a lever arrangement so that the operation of the tie puller causes it to grip the tie, and the grip increases with the resistance of the tie to movement, but does not damage the ties.

In its operation the tie puller is placed on the end of the tie outside the rail with the rack bearing against the web of the rail. The jack is operated by a bar long enough so that the workman stands erect when jacking. When the tie puller has been jacked out the full extent of the rack, it is loosened and reset and the procedure repeated until the tie has been fully removed or can be pulled out by hand. The tie puller can also be used for installing ties by placing it on the gage side of the rail under which the tie is started, using the same manner of operation as in the removal of ties.



The New Duff-Norton Tie Puller

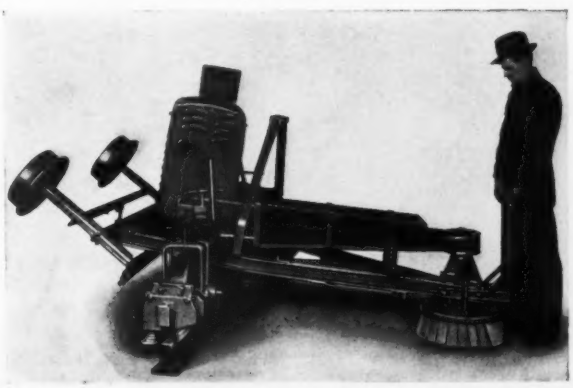
This tie puller is simply and ruggedly constructed, sufficiently light in weight to be easily handled, and has ample power for the removal of the longest switch tie. It is also stated that the use of this type of tie puller permits tie renewals to be made with minimum disturbance of the ballast and roadbed, that no tamping is necessary as the new tie fits tightly against the base of the rail and that it greatly speeds up tie renewal work, with a saving in labor costs of over 50 per cent.

Improvements in Nordberg Tie Adzer

THE Nordberg Manufacturing Company, Milwaukee, Wis., has redesigned its adzing machine to incorporate a number of improvements to meet more fully the requirements of those engaged in the laying of rail. In general, the improvements are refinements in design to facilitate various adjustments and provide greater convenience in operation, as well as to improve the quality of the work.

The new adzing machine is essentially the same in design and operation as the earlier model manufactured by this company, consisting of a 14-hp. aircooled engine which drives a revolving head in which the adzing bits are set. The improvements which have been made include a hand screw adjustment for quick, easy setting of the cutter head for different heights of rail and for canted rail; a built-in spirit level on the frame for the correct setting of the cutter head; simplification of the drive and elimination of the idler pulley; new improved guide rollers; a balanced point of lift for removing the adzer from the track with the rail crane and detachable collars between the flange wheels and wheel bearings.

These various improvements provide a number of advantages. Quick,



A Number of Improvements Have Been Incorporated in the New Nordberg Adzer

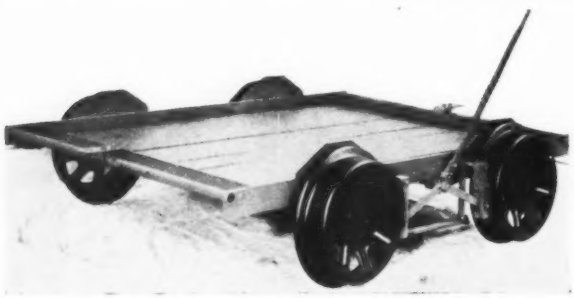
accurate adjustment of the cutter can be obtained in a few seconds by means of the large handled adjusting screws for the cutter head. The simplification of the drive permits adjustments of the cutter head without the necessity, also, for a belt adjustment, or the loosening of bolts and shifting the cutter spindle housing in reference to the frame. The new guide rollers, the inside roller of which runs in the flangeway space when adzing through highway crossings, permits the operator to maintain the proper gage of the adzing through crossings, without inconvenience or delay and the machine can be tilted back for removing the cutter head with the new guide rollers, without interference of the rollers with the ball of the rail. The point of lift has been designed so that the machine will balance when lifted either with the wheels in the position for transporting or in the position for adzing. The detachable collars between the flange wheels and the wheel bearings permit a quick shift of the cutter head in order to maintain proper alinement because of a difference in the size of tie plates.

Light Weight Trailer Car

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has produced a new light weight trailer, known as the T19 series A, with a 2000-lb. net load capacity, which is designed for use with light-weight motor cars, hauling material which cannot be conveniently accommodated on the motor car.

The T19 has a steel frame, with four large gussets to maintain alignment, and a wood deck. The tray is 51¼ in. wide and 68 in. long. A drawbar and lift pipe is provided at each end. For safety and convenience in removing the trailer from the track, rail skids are provided and both axles are the Fairmont differential type, which allow one wheel to turn independently of the other. The axle bearings are Timken two-row tapered roller bearings having a one-piece inner race. All four wheels are 16-in. in diameter, demountable and insulated, and the wheel base is 37 in.

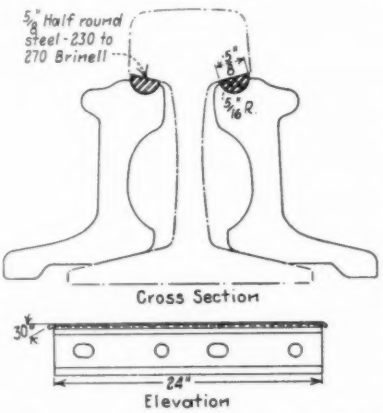
The trailer is said to be unusually strongly constructed for its weight, and is designed for safety and true running, smooth operation.



The New Fairmont Light Weight Trailer Car Has a 2,000-lb. Capacity

Head Contact Insert for Worn Rail Joints

THE Rails Company, New Haven, Conn., has developed a new head contact insert for reconditioning worn rail joints. Consisting of a half-round steel rod of 5/16-in. radius, the insert is said to be applicable to all types of joint bars. It is manufactured 1-in longer than the joint bar, with each end overlapping the bar approximately ½-in. and bent downward at an agle of 30 deg. with the horizontal in order to hold the insert in position. The steel can be furnished to any degree of hardness desired but it is recommended that it shall be of the same hardness as the rail with which it is to be used.



Section and Elevation Showing the Joint Reconditioning Inserts in Position

The new insert is intended primarily for the reclamation of worn joint bars which are milled along the entire lengths of their upper surface to provide a groove for the insert. It is said that maximum take-up is provided in this manner and that a new bearing is provided to contact the unworn portion of the fishing surface under the head of the rail. The milling of the bar can also be controlled to provide any desired crowning effect in the bar to compensate for wear under the rail head. It is said that the use of the half-round insert also provides an adequate contact under the rail head and rectifies any inequality of fishing angle, regardless of the angle at which the joint bar is applied. Moreover it is declared that bars can be milled so that the insert will provide a three-point bearing, with all bearings in the same plane or with the center crowned to compensate for wear under the rail head.

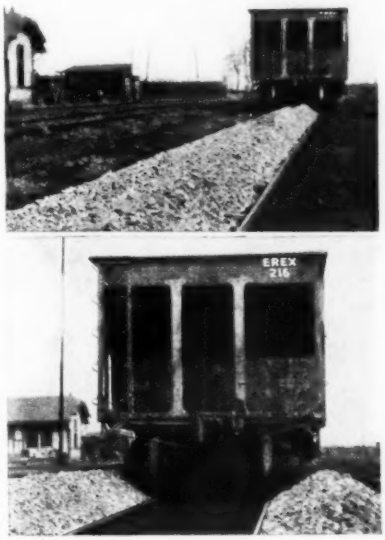
Multi-Service Ballast Car Improved

RECOGNIZING the importance of a car designed for the controlled distribution of ballast as well as for revenue service for such commodities as coal, gravel, sand and crushed stone, the Enterprise Railway Equipment Company, Chicago, has redesigned its 50 and 70-ton capacity multi-service ballast cars to meet these requirements more fully and also to comply with A.A.R. Standards of general dimensions, sizes of materials and simplicity of car parts.

The 50-ton car has an overall length of 34 ft., a height of 10 ft. 8 in. and a level capacity of 1,888 cu. ft. or 2,203 cu. ft. with a 12-in. average heap. Enterprise cast steel foundation bolsters effect a reduction in weight of 300 lb., reduce bolster parts from 50 to 18 and are said to increase the strength of the bolster structure. The light weight of the car is 46,000 lb.

The new design of the interior eliminates sharp corners and rivets so far as practicable and the slope of the hoppers has been increased to 36 deg. The arrangement of the light 5 ft. 3¾ in. longitudinal doors provides large hoppers and 18 in. clear openings, which facilitate the discharge of the ballast or other load material to the center or sides of the track or to bins below the track. Four 15-in. rolled steel channels extending from side to side of the car are used for hanging the doors, as a means of keeping the ballast free from the rails, and as reinforcing for the car structure. In addition each hopper is reinforced by a heavy angular frame extending around three sides and attached to the center sill. The longitudinal doors, when in closed position, fit closely against the frame and centersill of the cars.

All doors are interchangeable; when open they provide a slope of 36 deg., and they are locked and controlled by worms and gears in grease-packed bearings which provide graduated movement. Thus the operator may control a steady distribution of ballast in large or small quantities to the center, to one or both sides of the track or a portion to the center and one side only. Each side door is operated from its respective side at a point adjacent to the track, while the center doors are operated in pairs from either side of the car at points near the longitudinal center. Both center and side doors may be operated at the same time.



The Improved Ballast Car, Distributing, (Above) in the Center of the Track, and (Below) on the Shoulders

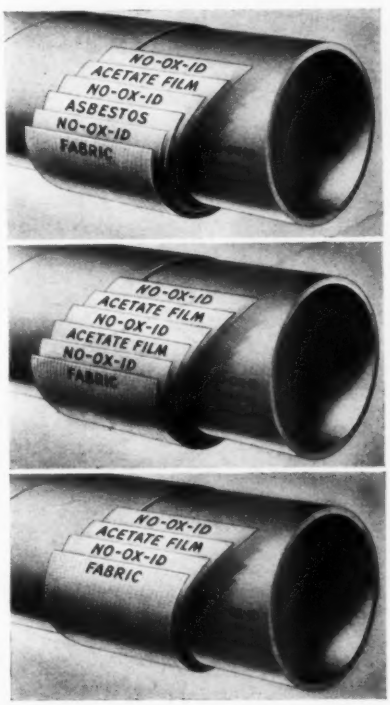
Colorflex Surface Treatment for Floors

THE Flexrock Company, Philadelphia, Pa., has produced Colorflex, a new floor finishing treatment for concrete or wood floors, which is suitable for interior or exterior use. This product is a pigmented compound consisting principally of resin and gums, which will penetrate concrete floors without injuring them and which will also preserve wood floors. It is available in four colors, battleship gray, tile red, emerald green and linoleum brown and can be easily applied by unskilled labor by brushing. It is applied in two coats; the first coat penetrates and the second coat provides a hard enamel-like finish.

It is said that Colorflex preserves both wood and concrete floors, and provides a hard, wear-resistant surface, that it will prevent dusting of concrete, is weatherproof, lime-proof and sun-resistant and will not crack, peel, check or craze.

Three New Pipe Protection Wrappers

THREE new types of NO-OX-IDized pipe wrappers have been designed by the Dearborn Chemical Company, Chicago, for the protection of underground or exposed pipe lines against severe moisture conditions, chemical action, oil, soil action and fungus growth. One of the new wrappers, known as the NO-OX-IDized reinforced asbestos wrapper, was designed specially for the protection of underground pipe against severe moisture conditions and physical and chemical action. It consists of a heavy asbestos layer impregnated with NO-OX-ID, reinforced with a light fabric and a layer of acetate membrane covered on both sides with NO-OX-ID. The wrapper is applied usually with the fabric on the outside, but when used without a top coat, it can be reversed with the acetate membrane on the outside.



Sections of the Three New Types of Dearborn NO-OXIDized Pipe Wrappers

A second wrapper, named the NO-OX-IDized dielectric wrapper, has been designed particularly for the protection of pipe under unusually severe moisture conditions and underground pipe where gound is intermittently wet and dry or oil-soaked. This wrapper consists of an open mesh fabric and two sheets of acetate membrane, each coated on both sides with NO-OX-ID. The acetate membrance is insoluble in oil.

The third wrapper, named the NO-OX-IDized reinforced fabric wrapper, is used for the protection of underground and exposed pipe of all sizes in combination with protective coatings against moisture, oil and mechanical injury. This wrapper consists of a fabric laminated with a sheet of acetate membrane. The fabric is impregnated and coated with a heavy grade of NO-OX-ID and the acetate sheet is also coated on both sides with NO-OX-ID.

All three wrappers can be wrapped by machine application and are sufficiently flexible to be applied over joints or irregular surfaces without danger of cracking. The wrappers are designed for application over regular NO-OX-ID coatings with a final service coat on the outside of the wrapper, but may be used with other types of coatings. It is said that the combination of fabric, acetate film and NO-OX-ID provides a wrapper that offers great resistance to the penetration of moisture and oil and has a high dielectric strength.

Monobloc Pumps

A NEW line of motor-pump units having a range of sizes and capacities has been introduced by the Worthington Pump & Machinery Corporation, Harrison, N.J. These units are designated as Monobloc pumps and involve in each case a centrifugal pump and a motor mounted together as an integral unit of balanced functional design. The new pumps are offered in sizes ranging from 1 in. to 4 in., and in capacities of as much as 1,000 gal. per min. against heads up to 280 ft.

These new pump units are said to be exceptionally compact, requiring a minimum of floor space, and yet to have ample space for repacking the stuffing boxes. They have large diameter shafts mounted on rigid-bearing mountings, which are said to maintain concentricity in all rotating parts. The motors are of the drip-proof type and are ventilated by a directed flow of air that is said to prevent moisture from being drawn into the motor.

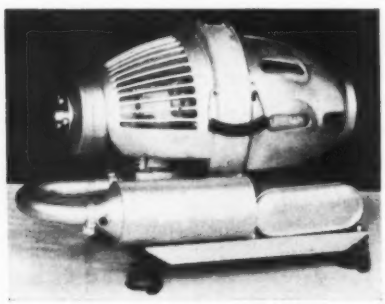
The new units are available in

One of the New Worthington Monobloc Pump Units

bronze fitted all-iron and all-bronze construction, with horizontal and vertical mountings and with motors of any desired electrical characteristics. Other features of the units include a special moisture-resisting varnish on the motor windings, solid front heads on the motors to prevent moisture from entering the motor housings, stuffing boxes especially designed for water seal, impeller lock nuts of special construction, and single-suction enclosed impellers hydraulically balanced to eliminate end thrust.

Portable Generator For B. & B. Work

A NEW generator, Model SHR, has been placed on the market by the Homelite Corporation, Port Chester, N.Y. This generator has a capacity



The New Homelite Generator for B. & B. Work

of 2,000 watts and is designed to fill the need for a medium-capacity, highly-portable generator for the operation of portable electrical work equipment such as is used by railway bridge and building gangs in their work.

The Model SHR is unusually compact, with the gasoline-engine motor and gasoline tank neatly mounted on a small spring-supported platform under the generator unit. The entire generator outfit weighs only 90 lb., and is said to be well constructed of high quality materials and workmanship. Its portability and light weight make it especially adaptable for use in bridge and building work.

Accessories for Nordberg Grinder

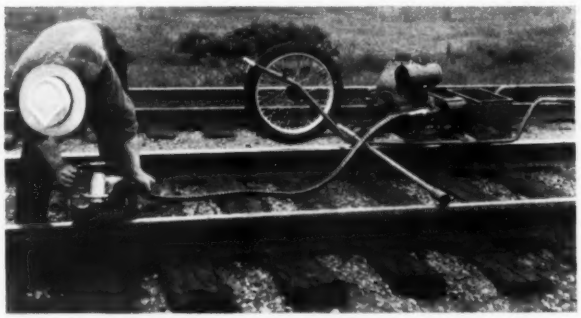
TWO new flexible shaft driven attachments have been developed by the Nordberg Manufacturing Company, Milwaukee, Wis., for use with the Nordberg utility grinder in light duty grinding and intermittent service.

One of the attachments is a free hand accessory and the other is a carriage-mounted type of grinder

The Nordberg Carriage-Mounted Grinder

having a flanged roller at each end. Both units are driven by a flexible shaft and have cupped wheels 8 in. in diameter with 2-in. faces. The housing of the grinding wheel in both units is of welded construction. The carriage for the carriage-mounted grinding attachment is constructed of light tubular steel wherever possible, and a handwheel is provided for accurate vertical adjustment of the grinding wheel. The end rollers of the carriage are shaped so that when the carriage is rocked on the rail, the contour of the rail is maintained. The carriage-mounted grinder, when rolled back and forth along the rail over the area where grinding is to be done, produces a ground surface of extreme accuracy.

Both units are designed for light duty grinding for smoothing up welds at rail joints, equalizing the height of cropped rail, removing mill tolerance and other grinding operations where a cupped grinding wheel may best serve the purpose.



Both the Hand-Held and Carriage-Mounted Attachments Are Flexible-Shaft Driven

Improved Line of I-R Compressors

INGERSOLL-Rand Company, New York, has re-designed and improved its line of Type 30 industrial compressors and vacuum pumps. Major changes have been made in the design of the cylinders, valves and cylinder heads. The complete line includes compressors and vacuum pumps ranging from ¾ to 5-hp., while the complete range of Type 30 compressors comprises various sizes up to 15 hp. Adapted to many railroad uses, including paint spray outfits, the operation of automatic-pneumatic highway crossing gates, emergency or standby units for the operation of pneumatic switches and signals, for furnishing small supplies of compressed air at pressures differing from that carried in regular shop lines, liquid agitation, the starting of Diesel engines, the operation of control valves, the transfer of oil or liquids and many other applications. The compressors are available in a wide variety of models delivering air at low, intermediate or high pressures with a maximum of 1,000 lb. per sq. in.

The semi-steel cylinders, of V-type construction, are cast separately, honed and lapped, and bolted to the crank case. This design and manufacture are said to improve cooling and provide smoother operation. Air-cooled cylinders and heads eliminate

the use of water, while deep cooling fins are said to add to the efficiency of the units. Among the outstanding improvements listed for the compressor sizes from ¾ to 5-hp., are heat treated stainless steel finger valves which are said to eliminate breakage and warping of valves, provide added performance and reliability and which are readily accessible without breaking pipe joints.

Type 30 compressors are furnished as complete receiver-mounted units, baseplate-mounted units for use in conjunction with an approved receiver which is already available or where space limitations make it desirable to locate the compressor at some distance from the receiver, or bare units to be used with belt drive from line shafting, or where the compressor is to be incorporated as part of another machine. The complete units are furnished with either

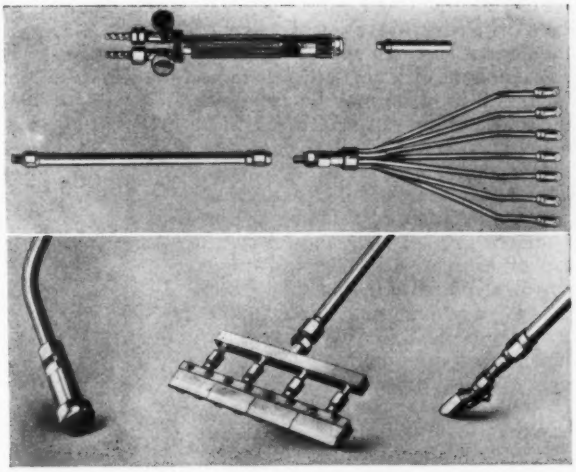
One of the I-R Small Capacity Compressors

electric motor or gasoline engine-drive. The electric units may be supplied with automatic start and stop control where the demand for air is definitely intermittent, constant speed control for relatively constant demand, or a dual control which comprises a combination of both methods of regulation and which is designed to provide constant speed control during periods of steady demand but also allows manual switching to automatic start-and-stop control during periods of intermittent or small demand. The gas engine models may be provided with hand start and automatic stop control.

Flame Descaling, Cleaning and Dehydrating

THE Air Reduction Sales Company, New York, has perfected a process of flame descaling, cleaning and dehydrating steel and iron, prior to repainting old structures or prior to painting or processing steel in the mill, which is basically different from other methods of cleaning or descaling and for which process important advantages are claimed.

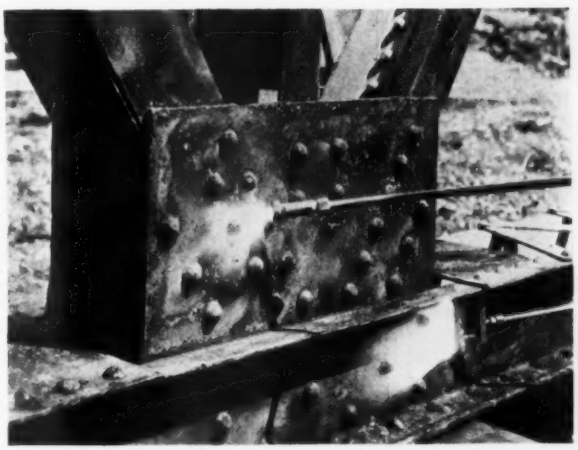
The success of this process is based principally upon the theory that surfaces, although apparently dry but which contain moisture, cannot be painted successfully because the moisture that is present under the old paint or mill scale or under the new coat of paint, will continue its destructive action and cause paint-lift and surface oxidation within a relatively short period of time.



Some of the Various Types of Single and Multiple-Flame Tips Available for Flame Descaling and Cleaning

In flame cleaning and dehydrating old steel structures before repainting, the process consists of the quick passage of a blast of oxy-acetylene flame at an angle of approximately 45 deg. with the surface being cleaned, which heats only the surface to a temperature ranging from 212 deg. F. to 300 deg. F. The passage of the flame causes the old paint to loosen and cockle and sufficient heat is imparted to the surface to drive off or dehydrate any moisture which may be present, even under the old paint film. If seven or eight coats of old paint are encountered, several passes of the flame with intermittent light wire brushing by hand may be required. The final passage of flame treatment is followed immediately by power wire brushing and this in turn is followed within a period of two hours, or before the surface of the steel has cooled enough to allow any recondensation of moisture, by the application of the paint. In cases where deterioration of the structure has progressed to an unusual degree, resulting in a thick layer of rust or iron oxide, this layer should be scraped off prior to flame cleaning. In any case, after flame cleaning, sand blasting must not be used to remove the loosened paint, scale or rust, because of the moisture in the compressed air and the cooling affect on the surface of the steel.

In the use of this process for the removal of mill scale on new steel at the mill before further processing or before shop painting, usually one pass of the flame is all that is required to remove nearly all of the scale and all moisture that may be present. Removal of all of the mill scale before application of the shop coat of paint is not considered necessary because the scale that withstands the high-temperature oxy-acetylene flame is sufficiently tenacious to remain fixed after painting.



This Type of Tip Is Best Adapted to Cleaning Rivet Heads, In Corners and Other Inaccessible Places

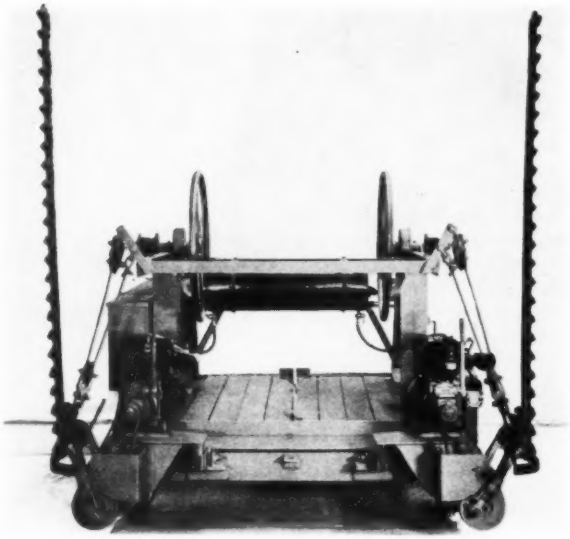
For the performance of this work, the Air Reduction Sales Company has developed three special types of tips. In flame cleaning a flat surface, flat tips 2 in. wide may be mounted in rows ranging in width in 2-in. increments up to 12-in. on removable hard faced wearing skids. This type of tip provides a row of close formation small brush-like flames. For cleaning rivet heads, fittings, corners and other places inaccessible to a flat tip, a round tip with a hard faced annular wearing ring is available and where flexibility on irregular surfaces is required a flexible finger-type tip is provided, composed of seven flexible copper tubes, which may be bent at will and which have tips providing five grouped flames at the end of each.

In the operation of the flame the process is more or less self-regulating. The operator moves the flame back and forth and progresses slowly at a speed of 8 to 15 lin. ft. per minute for the removal of paint from old structures, and at a speed of from 12 to 20 lin. ft. per minute for the removal of mill scale. As the operator progresses he quickly adjusts his speed, because if he moves too slowly the tips will "gum up" with softened paint and if he moves too swiftly the paint will not cockle and will be difficult to scrape or brush.

Fairmont Improves Its M-5 Weed Mower

SEVERAL important improvements in the Fairmont-Rawls M-5 series A weed mower, to provide for smoother running and greater dependability, have been announced by Fairmont Railway Motors, Inc., Fairmont, Minn. The outstanding feature is the application of a new power unit which includes a clutch in the power take-off, so that the driving unit may be disengaged at the will of the operator and the engine allowed to idle. This feature is said to provide additional safety, minimize wear of the cutting bar and pitman, and afford easier starting since the engine may be allowed to warm up thoroughly before operating the sickle. The new engine is also equipped with an oil bath type air cleaner, a fuel filter and an externally mounted magneto.

Another important improvement is the new design of the renewable bushings in the swing gate assembly, where larger bearing areas have been provided and unit bearing pressure has been reduced. The V-belt drive is protected with a special guard which keeps out foreign matter and thereby increases belt life. A single gasoline tank mounted on the frame of the mower and connected to each of the two engines by flexible leads, supplies the fuel. Additional improvements include a cast steel pitman drive wheel with integral pin and the use of chrome molybdenum steel for the pitman crank wheel shaft.



A Number of Improvements Have Been Made in the Fairmont-Rawls M-5, Series A Weed Mower

The new power unit has been designed so that it may be applied to any Rawls M5 weed mowers manufactured prior to 1940 and used in conjunction with the existing cutting bars. It is said that field tests and service operation during the last year have demonstrated that the new machine gives more satisfactory and economical service.

Automatic High-Speed Whiteprint Machine

THE Ozalid Corporation, Johnson City, N. Y., has placed on the market its new Model A high-speed automatic whiteprint machine in which the functions of printing and developing are combined in one compact unit which can be easily installed in any drafting room.

The whiteprint machine utilizes a single, new high-pressure mercury vapor lamp, which is said to have been designed and developed especially for this machine. A variable primary circuit of the transformer permits regulation of the intensity of the light, from full brilliancy to 60 per cent of the maximum without loss of energy. The operator feeds the tracing and Ozalid sensitized material into the front of the machine and the print and the tracing are discharged at the rear of the machine, after dry development, it is automatically separated after exposure, the tracing being returned to the front of the machine, while the print is conveyed to the developer, where, after dry development, it is chine.

The white printing machine is capable of a printing speed up to 20 ft. per minute. It is said that this machine, with its new mercury vapor lamp, provides good printing, that the transformer dimming arrangement allows the operator to select the intensity of light required, which

The New Model A High-Speed Automatic Whiteprint Machine

permits continuous and uniform production of white prints despite variations in the tracings. The automatic separation of tracing and print makes it possible to use either cut sheets or continuous yardage interchangeably, substantial savings being realized by the use of standard

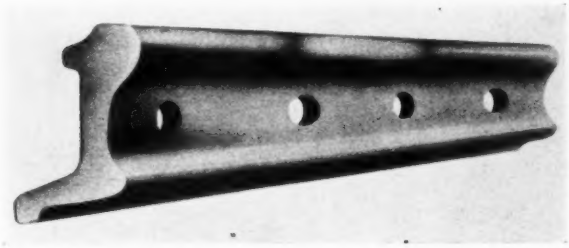
cut sheets when the majority of the drawings conform to certain fixed dimensions. It is also said that because of the design of both the printing and developing units and the use of the highly efficient mercury vapor tube, the current consumption of the Ozalid Model A whiteprint machine is less than half that of the ordinary blueprint and developing machines of equal capacity.

Headfree Angle Bars With Center Overfill

A NEW type of headfree 100 Per Cent angle bar with a lateral horizontal overfill at the center of the head of the bar for use with new or old rail has been added to the line of angle bars manufactured by the Rail Joint Company, New York, which it is said will increase considerably the life of both rail and joint and minimize or retard the development of batter when applied to new or old rail and will compensate for wear when applied to old rail.

For application on new rail, the angle bar is designed with a uniform lateral horizontal overfill approximately 1/64 in. in thickness on the head of the bar 6 in. to 8 in. in length at the center of the bar and extending an equal distance on each side of the center. The remainder of the angle bar is of uniform standard section.

The overfill angle bar for application on old rail is designed on the same principle but the entire angle bar is rolled slightly oversize for its entire length by an amount sufficient to compensate for wear. In addition, the amount of lateral horizontal overfill on the head of the bar is slightly greater, approximately 1/32 in. or less, and tapers from its maximum at the center of the angle bar to practically zero at the end of the overfill portion of the bar, approximately 3 in. to 4 in. each side of the center of the angle bar.



The New Bar, With Lateral Horizontal Overfill, Is Adapted to Both New or Old Rail

It is said that this angle bar provides a more accurate initial fit at the center of the rail joint, that a greater depth of material is placed at the point of maximum wear, and that positive contact is maintained at the center. This results in better sustained bolt tension, wear is retarded, and there is less tendency for the rail ends to batter, all of which contributes to greatly reduced joint maintenance.

New Prest-O-Lite Floodlight Assemblies

THE Oxweld Railroad Service Company, Chicago, a unit of the Union Carbide and Carbon Corporation, New York, has developed two new Prest-O-Lite acetylene floodlight assemblies, which are suitable for use during night construction work, in tunnels, derailments at night and other emergency work.

The New Two-Burner, Prest-O-Lite Floodlight

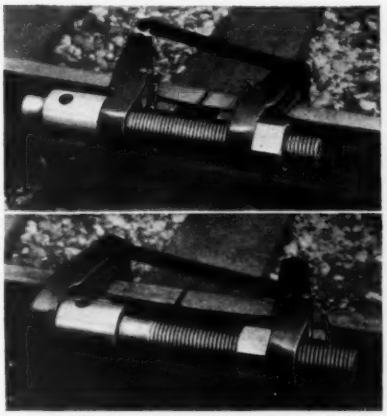
The two assemblies are essentially alike except that one, the No. 06P29 is a double floodlight while the other, the No. 06P28, is a single floodlight. The lights consist of a burner with a 13-in. non-tarnishing chromium-plated reflector with a pipe mounting which is connected directly to WK cylinders of dry, freeze-proof Prest-O-Lite acetylene. Each light has 4000 candlepower and the direction of light is controlled by a vertical swing joint for each reflector, so that the No. 06P29, the double floodlight, can be used to concentrate or spread the illumination or to illuminate areas in opposite directions. The flow of the acetylene is regulated by the key valve of the acetylene cylinder.

It is said that these floodlights furnish a broad even beam of clear white light that is strong at the sides as well as at the center and that they are sturdily constructed so that they cannot be blown over, even in a high wind, when attached to the WK cylinders.

Simplex Rail Joint Puller and Expander

Templeton, Kenly & Company, Chicago, has produced a rail joint spacer, designated as Simplex No. 555, which can be used as a puller or expander for closing or opening expansion at rail joints, for renewing insulated joints and end posts, for lining crossings and switches and for pushing or pulling continuous rail lengths.

The rail joint spacer consists essentially of two arms which fit over the ball of the rail without removing the angle bars, and connected by a steel screw and nut. One end of the steel screw has a head drilled with holes for the application of a lever bar and the nut is applied on the other end. Two dogs with machined teeth on one edge are placed between the outside of the ball of the rail and each arm, so that operation of the screw causes the arms to exert a cam pressure on the dogs and grip the rail firmly.



Above—The Joint Spacer Applied to Close a Joint. Below—As Applied to Open a Joint

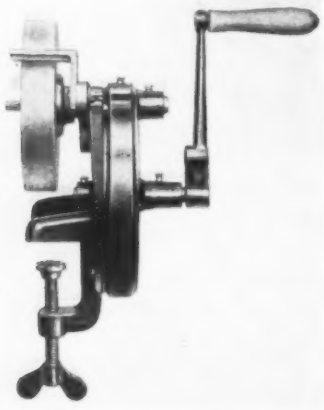
The entire device is used as a push or pull jack between the rail ends at the joint. For expanding, or increasing, the rail joint opening, the arms are set over the ball of the rail in a

"toed-in" position and the screw and nut are placed between the arms so that operation of the screw pushes the arms apart. To pull or close the expansion opening between the rail ends, the arms are placed in a "toed-out" position, and the screw and nut are placed so that operation of the screw pulls the arms together. In either operation, the track bolts and angle bars should be loosened, and the tie bar or latch must be disengaged, before operating the screw. Two levers can be inserted for operation by two men, thereby increasing speed and power.

The rail joint spacer has a capacity of 15 tons. It is light in weight, can be applied quickly and can be operated by one man. It is said that it can be quickly removed for the passage of trains, because the action of the arms on the toothed dogs is based on the principle of cam pressure instead of a wedge action.

New Buda Tool Grinder

THE Buda Company, Chicago, has developed a new tool grinder known as the Buda No. 70, which was designed specially for railroad tool maintenance. The grinder weighs 24 lbs., has a 7-in. diameter by 1½ in. grinding wheel and a one-piece gear case, with the gear, gear pinion and crankshaft housed in one casting to insure perfect alignment. The clamp is integral with the gear case cover and the clamp screw is of ⅝-in. steel 5½ in. long. The clamp screw closes to ½ in. and opens to 3 in. The crankshaft is ⅝ in. in diameter and the crank length is 8½ in. Large spring-lid type oil cups are provided for easy lubrication of the moving parts.



The New Buda No. 70 Tool Grinder

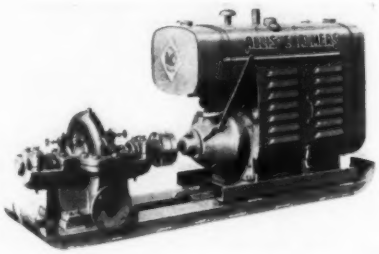
The Buda No. 70 is said to be constructed of the best materials and will give years of sharpening and grinding service with a minimum of wear and maintenance expense.

Engine-Driven Centrifugal Pumps

THE Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has developed a line of combination engine-driven centrifugal pumps, available in many combinations of sizes, to provide independently-powered pumps for drainage, gravel and coal washing plants, construction jobs and as stand-by units in emergencies when other sources of power fail.

The units consist of a horizontal shaft, single stage, single or double suction centrifugal pump connected directly to an internal combustion engine mounted on a skid type base. All power units have valve-in-head medium speed engines, with removable cylinder liners, force feed lubrication and a variable speed governor.

The pumps are available in many sizes to meet various requirements up



One of the New Allis-Chalmers Portable Engine-Driven Centrifugal Pumps

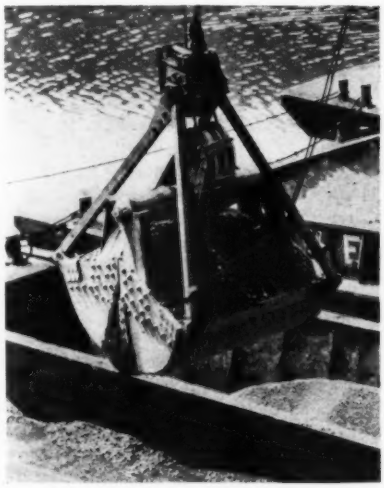
to 5,000 gal. per min., and heads up to 100 ft. The power units are available in five sizes, from 18 to 110 hp. and suitable for use with a variety of fuels, including gasoline, kerosene, distillate, natural gas and butane.

Improved Clamshell Bucket Design

THE Blaw-Knox Company, Pittsburgh, Pa., has developed a lever arm clamshell bucket that is designed to withstand the shocks and impact blows which result when the crane operator drops the bucket to secure the advantage of good initial penetration.

The new bucket is constructed with all four corner bars mounted directly on the head pin so that all stresses are carried directly to the corner pins. In addition the cast steel head block is secured in position between two plates, joining one pair of corner bars together in such a manner that a rigid A-frame assembly is obtained.

It is said that this new type of bucket construction reduces the maintenance problems resulting from the practice of "dropping the bucket," by the elimination of bolted or riveted



One of the New 1¾-yd. Lever-Arm Type Buckets Loading Sand

connections between the head pin and corner pins, which usually become loose under severe service, and that the method of mounting the head block to obtain a rigid A-frame assembly insures a rigidity which maintains permanently true alignment between the upper sheaves and the lower sheaves, a condition conducive to long cable life and reduced operating costs.

Air-Operated Sludge Pump

A NEW air-operated sludge pump, the design of which is based on the ejector principle, has been placed on the market by the Chicago Pneumatic Tool Company, New York. This pump embodies a cylindrical drum with water inlet and outlet openings at the bottom, which are 2 in. and 2½ in. in diameter, respectively, and air inlet and discharge openings at the top, which are ¾ in. and 1 in. in diameter, respectively. When the pump, which is known as Type No. 7, is in service, compressed air flows through the air inlet and creates a vacuum which causes water to be drawn into the drum through the inlet at the bottom until a float valve shuts off the air discharge. The air is then forced into the drum instead of passing out through the air discharge orifice and

the pressure thus created forces the water out through the water discharge opening. Thus the pump has a pulsating flow somewhat similar to that of a hand pump.

Advantages claimed for the Type No. 7 sludge pump are that it has a high lift capacity with a low consumption of air; that it will pump fluids containing up to 15 per cent solids; and that it will handle water containing sand or rock drill cuttings without causing rapid wear of expensive

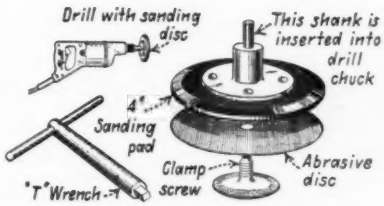
The Operation of the New Air-Operated Sludge Pump is Based on the Ejector Principle

replacement parts. It has an overall height of 24½ in., a width at the base of 10¾ in. and weighs 95 lb. The handling of the unit is facilitated by a hand grip located at the top.

Mall Sanding and Buffing Pads

THE Mall Tool Company, Chicago, has developed a line of pads designed specially for backing the abrasive discs in sanding, rubbing, polishing and buffing work. These backing pads are constructed of rubberized fabric with rubberized fabric or sponge rubber faces, depending upon the purpose and type of the pad. Some of the pads are steel disc reinforced and all have cadmium-plated steel hubs, with the exception of the marble polishing pad, which has a special aluminum backing and hub.

The standard Mall pad has a ¼-in. hole and is mounted on the hand spindle mandrel so that it will turn freely. The abrasive disc is placed on the face of the pad and held in



Details of the Mall Sanding Pads

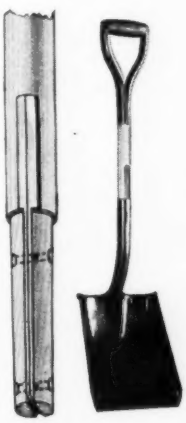
place by a countersunk clamp screw, which is tightened by turning the pad and abrasive disc while the hand spindle shaft is held in a wrench.

Pads of various diameters are available for ordinary sanding work, heavy duty sanding work, wet sanding and lacquer rubbing. In addition, a special lacquer polishing pad 8 in. in diameter and a special marble polishing pad 6 in. in diameter are also available. The pads are designed specifically for each type of work to produce the best results with high speed operation. They may be purchased in complete assemblies, including the sanding pad, T wrench and clamp screw.

Shovels With I-Beam Handle Reinforcement

THE Wood Shovel and Tool Company, Piqua, Ohio, has designed a new type of I-beam handle reinforcement for the portion of the shovel just above the socket, which, without materially adding to the weight, greatly increases the strength of the handle and shank of the shovels at the point where most shovel failures occur.

The I-beam type of reinforcement consists of two steel members, each



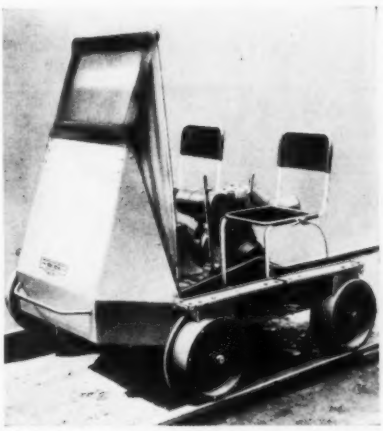
The I-Beam Handle Reinforced Shovel and a Detail of the Reinforcement

drilled for rivet holes, which fit into a slot in the lower or socket end of the wood shaft. A portion of the two steel members, when placed back to back as they are in assembly, combine to form an I-beam section. The handle with the I-beam members in place is inserted into the socket up to the point where the steel members flange out to form the I-beam section. The entire assembly, consisting of socket, I-beam members and handle, is then riveted together to form a unit.

It is said that this type of construction increases the strength of the handle 30 per cent in the section just above the socket where approximately 65 per cent of all handle breaks occur and that with this type of construction the handles remain tight under all weather conditions.

New Buda Light Inspection Car

A NEW light inspection motor car, seating one or two men and designated as Buda No. 130, has been



The New Buda No. 130 Inspection Car

placed on the market by the Buda Company, Harvey, Ill. It is a fast lightweight car of low initial cost and is said to require a minimum of maintenance. Its outstanding characteristics include rubber pedestal type axle bearings which are said to eliminate jars due to rail joints and rough track; an automotive-type air-cooled free-running engine; integral cone friction type transmission; a heavy gage sheet metal front shield; a built-in windshield; large tool space; front wheel chain drive; center rail skid; large quick-stopping brakes; pressed steel frame; three simple controls and a net weight of 465 lb.

Powered with an automotive type, 4-cycle, single cylinder engine which develops 5.85 hp., the weight of the standard model may be reduced by approximately 30 lb. by utilizing a special engine made of aluminum alloy.

The engine has a rope starter, adjustable governor, air cleaner, counter balanced crankshaft and a high tension magneto. The 14-in. diameter, wood center wheels are mounted on 1¼-in. diameter heat-treated steel axles with one free running wheel on each axle.

Adjustable, equalizing brakes are mounted on the tops of the wheels and also act as guards. The rail skid, located at the center of the car, makes for easy handling as there are no obstructions on the bottom of the car. Two adjustable tubular all-metal seats are provided and the controls consist of a throttle, brake and a forward and reverse lever. The overall length is 59¼ in., the width overall is 64⅜ in., the wheel base is 35 in., the body width is 42½ in., the body length is 51 in. and depth of side frame 7¾ in.

Lightweight 5-Ton Emergency Jack

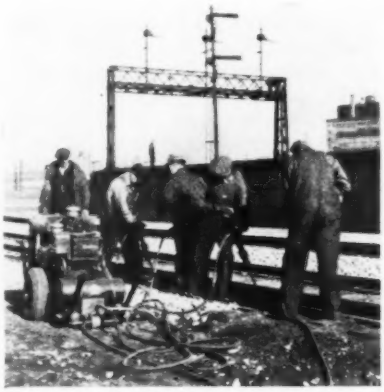
TEMPLETON, Kenly & Company, Chicago, has developed a lightweight single-acting, automatic raising and lowering five-ton emergency jack, designated as the Simplex No. 522. The new jack is identical with the Simplex No. 310A, which has a capacity of 15 tons, except that it is proportionately smaller. It has a large inner-ribbed base, a double lever socket for operation in close quarters and the toe lift is machine-corrugated. It weighs 44 lb., has a lift of 14 in. and a height of 22 in. and is furnished complete with a 4½-ft. chain, an auxiliary cap shoe and a 36-in. heat-treated lever bar.

The New 5-Ton Emergency Jack

Similar to other jacks manufactured by this company, the No. 522 tilts on its base, when the base pawl is disengaged, permitting angular jacking or pushing and pulling. Lifts may be made on the cap, the auxiliary shoe, the toe or at any intermediate point by using 4½-ft. 7/16-in. BBB chain, which is fitted with a grab hook, as a sling.

New Schramm Portable Compressor

SCHRAMM, Inc., West Chester, Pa., has designed a model of its compact, portable Fordair compressors especially for railroad use, which it has named the Railroad Trail Builder, and which can be used for pneumatic



The Railroad Trail Builder at Work Powering Four Tie Tampers

track tamping work, pneumatic rock drills and hammers and for the operation of a wide variety of pneumatic tools used by bridge and building gangs.

The Railroad Trailbuilder consists of a standard eight-cylinder Ford V-8 block, in which four cylinders, two in each bank, are converted to air compression, and four cylinders are power cylinders. Each compressor cylinder has a poppet type intake valve and all intakes are provided with oil bath type air cleaners. The cooling system consists of a radiator and two heavy duty truck-type Ford water pumps, one for each cylinder bank. Lubrication is of the standard Ford type, with a full pressure feed supplied by a gear type oil pump to all main connecting rod and camshaft bearings and to the timing gear.

The compressor-power unit is mounted on a tubular frame, rectangular in shape, of 4-in. pipe with smaller cross pieces. The 4-in. pipe also serves as the air receiver. Two pneumatic-tired wheels are provided on each side at the middle of the unit

The Trail Builder Being Moved on the Rail

and, with two pipe handle bars which are inserted in sockets at one end of the frame, it can be handled by one man like a wheelbarrow. In addition, two flanged wheels are provided at each end so that one man can push it on the rail and remove it for off-track use.

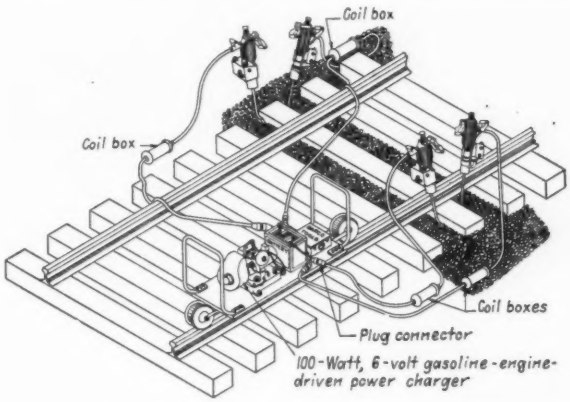
The entire unit has a weight of 960 lb., an overall length of 59 in., a width of 32 in. and a height of 43 in. It has an operating speed of 1390 r.p.m. and delivers 55 cu. ft. of actual air at 100 lb. pressure. It is equipped with an electric push button self-starter, a fuel tank of 12 gal. capacity, a metal housing or cover, which can be locked, and can be ordered with an extra pair of pipe handle bars for use on the other end of the unit. It can also be equipped with Jumbo balloon tires instead of the standard pneumatic tires.

The Railroad Trailbuilder is also available in a number of other types of mountings, including a four flange-wheeled mounting for on-track operation with forward and reverse transmission and a chain drive geared to speeds up to 40 m.p.h. It is unusually compact and portable for a compressor of its capacity.

Central Power Plant for Barco Tampers

A SMALL portable central power plant designed for use with Barco type K-1 or TT-2 tytampers in units of 4, 8, 12, 16 or 20 tampers, has been developed by the Barco Manufacturing Company, Chicago. The power plant consists of a 110 ampere-hour storage battery, a 100-watt, 6-volt, gasoline engine-driven charger for continuous or intermittent charging of the battery and a small tool box mounted on a wooden

platform. The platform is equipped with handles at each end and with small wheels for rolling the unit along the track on one rail. The entire assembly is light in weight and can be quickly lifted off the track to allow the passage of trains.



Showing Details of the Barco Tie Tamper Hook-Up With the New Central Power Plant

The tytampers are connected to the battery of this unit by the coil and battery hookup described on page 483 of the August, 1939, issue of *Railway Engineering and Maintenance*. The unit was designed principally for use in continuous out-of-face tamping with larger gangs or in spot tamping where four or more tampers are used.

Three International Diesel TracTracTors

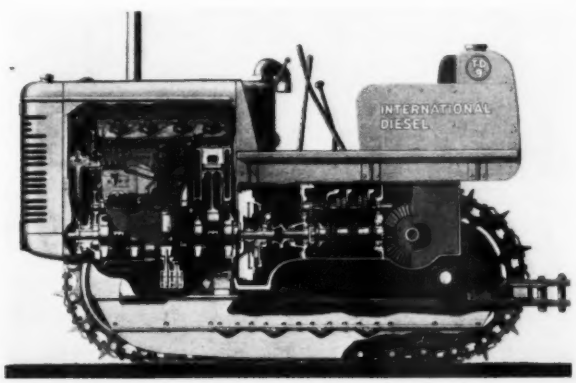
THE International Harvester Company, Chicago, is introducing three Diesel crawler-tractors, the TD-6 TracTracTor, smallest of the three new models; the TD-9, next in size; and the TD-14, largest of the three, all of which are companion models of smaller size, but similar in style and engineering to the TD-18, which was described on page 168 of the March, 1939, issue of *Railway Engineering and Maintenance*.

The TD-14 weighs from 15,000 to 15,500 lb. depending upon the type of treads, develops 53.5 drawbar horsepower, has an overall length of 134 in., and an overall width with narrow treads of 74 in. The TD-9 weighs 9,500 to 9,850 lb., develops 38 drawbar horsepower, has an overall length of 114 in. and an overall width with narrow treads of 58⅞ in. The TD-6 weighs 6,800 to 7,100 lb., develops 30 drawbar horsepower, has an overall length of 104 in. and an overall width with narrow treads of 53 in.

The TD-14 Trac-TracTor Developes 53.5 Drawbar Horsepower

Similar to the TD-18, all three of the new TracTracTors are started on gasoline, and after a minute or less of operation, shift to full Diesel operation. The conventional automotive-type electric starter, which is regular equipment on the TD-18, is available as special equipment for the three new models. The TD-6 and the TD-9 are provided with five forward and one reverse speed and the TD-14 has six forward and two reverse speeds, provided by a selective type of transmission. All models are provided with a variable-speed type engine governor.

The engines of each of the three new models have four cylinders, and are of the four-cycle, full-diesel type. The cylinder sleeves are replaceable. A well-ribbed and braced engine block of cast alloy iron forms the housing for the working parts of each engine. The crankshafts are constructed of drop forged alloy steel and in addition to the usual heat treatment, are Tocco hardened. A one-piece main frame forms a rigid backbone for each TracTracTor and the same type of track frame and stabilizer construction used in the TD-18 is used in the three new tractors, in which the track frames are attached to each other to form a well-braced rectangle, while free track oscillation is obtained by pivoting the track frames on the ball-and-socket joints on the rear axle.



A Cut-Away View of of the Model TD-9 TracTracTor

Other important features include an over-center clutch with low-inertia driven members and an automatic clutch brake for fast gear shifting; adjustable steering levers and pedals to suit the operator; track shoes keyed to the track links to eliminate the loosening of shoes; full-pressure engine lubrication at all working angles by a multiple-gear oil pump; a thermostat-controlled centrifugal pump cooling system; and quintuple-sealed track rollers to keep out dirt. Each tractor is available in treads of two widths, and track shoes are available in a variety of sizes and types. A large inner-spring seat, fully upholstered, provides room for the operator to change position and be comfortable.

It is said that the TD-14 and TD-9 models, owing to their efficient op-

erating characteristics, have more power, greater adaptability and a wider speed range than older models of comparative size. The TD-6 is entirely new and is the smallest Diesel TracTracTor ever developed by this company.

New Streamlined Jackson Tie Tamper

THE Electric Tamper & Equipment Company, Ludington, Mich., has developed, during the last year, a new streamlined Jackson electric tie tamper of considerably greater power and effectiveness than the former model. This new tamper operates on the same principle as the former model, that is, the rotation of an unbalanced weight by an electric motor produces a rapid vibration at the end of the tamping blade, but in it much more effective transmission of energy is obtained by placing the unbalanced weight closer to the tamping blade. Furthermore, more power and ease of operation have been secured by lowering the center of mass of the entire motor assembly.

In addition to these improvements, the motor is now enclosed in a streamlined acorn-shape case without projecting lugs and bolts. This case is entirely waterproof and can be disassembled by removing only one nut. The new tamper has grease-packed bearings, permitting the tool to be operated a full season without additional lubrication, and a simple attachment is provided for quickly and easily regulating the flexibility of the handle. Engineering calculations with respect to the increased efficiency of the new design, and the results of factory experiments in this regard, conducted over a period of more than a year, are said to have been substantiated by extensive field tests.

The Streamlined Tamper Has Substantially More Power than the Earlier Model

Chrome-Face Lufkin Steel Tapes

THE Lufkin Rule Company, Saginaw, Mich., has placed on the market a new line of steel measuring tapes named Chrome Face, which are said to be entirely new and different, and to be an outstanding advance in the manufacture of steel measuring tapes.

The Chrome Face tapes, as their name implies, are chrome plated and have a satin chrome-white surface which is said to be unusually free of glare. The permanent markings are jet black and stand out in sharp contrast. The Anchor line of chrome face tapes are enclosed in genuine leather cases. The tapes are available in two widths, ⅜-in. and ½-in., and in two graduations, feet, inches and eighths and feet, tenths and hundredths.

The New Tapes Have Distinct Advantages

It is said that the new chrome face tapes are easy to read, even in artificial or poor light, that they are extra strong, resist rust, are easy to clean and will not crack, chip or peel.

New Direct-Drive Spray Painting Outfit

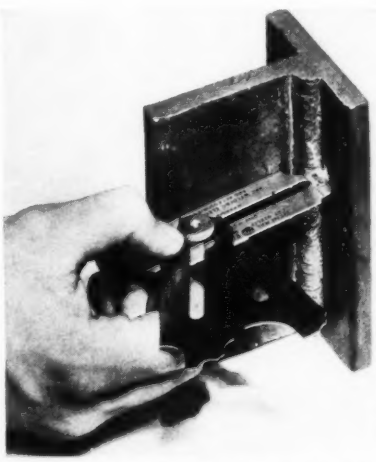
THE DeVilbiss Company, Toledo, Ohio, is introducing a new direct drive spray painting outfit to serve the field where medium and small, light duty units are required. Known as Type NCK, the unit is operated by a 1/3 hp. electric motor direct-connected to a piston-type single cylinder compressor which has a displacement of 4.58 cu. ft. of air per min. and is mounted on a metal base equipped with rubber feet. The cylinder has a bore of 2 in. and a piston strike of 1½ in. Maximum working pressure is listed as 40 lb. per sq. in.

A fan-type counter-balanced flywheel is used to minimize vibration and provide cooling. The finned air chamber relieves pulsation and serves as an oil and moisture separator. The unit is provided with a safety valve, drain valve, connection for hose and a 12-ft. electric cord with attachment plug, while a switch at the motor contributes to convenient operation from an electric outlet. Adapted for use with either of three different DeVilbiss assemblies of spray equipment, the outfit is said to offer economy not only in initial outlay but in operation as well.

The New Light-Duty DeVilbiss Paint Spraying Outfit

G.E. Fillet-Weld Gage

THE General Electric Company, Schenectady, N.Y., has devised a new fillet-weld gage of convenient size to be carried in a shirt or trouser pocket for fast, accurate checking of the size of fillet welds on work which must meet rigid specifications. The gage consists of three stainless-steel stampings, held together by a bolt and a knurled thumb nut. Convex, concave or standard fillets can be checked by fitting the edge of the gage flush against the work so that the indicating portion of the gage rests on the weld



How the G. E. Fillet-Weld Gage Is Used

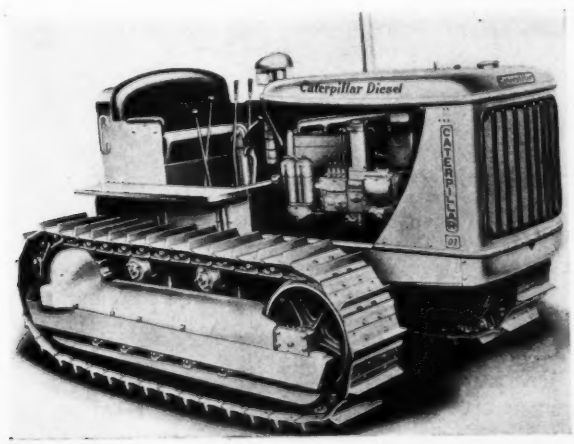
head. The gage can be used to measure fillets of ¼ in., 5/16 in., ⅜ in., 7/16, ½ in., and ⅝ in. sizes, which are clearly marked in black.

New 75-Hp. Diesel Caterpillar Tractor

THE Caterpillar Tractor Company, Peoria, Ill., has announced a new tractor known as the Diesel D7 that is designed for heavy duty service. Developing 75 hp. at the drawbar, the new tractor will handle 4-cu. yd. rollover scrapers, 9 cu. yd. carry-type scrapers, 10 to 13 cu. yd. track-type wagons, 13-cu. yd. pneumatic-tired wheel wagons, 8 to 10-ft. bulldozers, 10 to 12-ft. trailbuilders, snowplows cutting 10 to 11-ft. swaths in heavy snow or other work with similar loads.

The Diesel D7 tractor has an overall length of 13 ft. 6¼ in., a width of 8 ft. 2 in., a height of 6 ft. 8 in. and a shipping weight of 23,500 lb. Equipped with five forward speeds ranging from 1.4 to 6 m.p.h. and four reverse speeds varying from 1.6 to 5.4 m.p.h., it has a 74-in. gage center to center of tracks, operates on commercial Diesel fuel and is equipped with an independent 2-cylinder 4-cycle vertical gasoline engine used for starting. The Diesel engine is of the 4-cycle 4-cylinder water cooled type with a bore of 5¾ in. and an 8-in. stroke with a rated speed of 1,000 r.p.m. at full load.

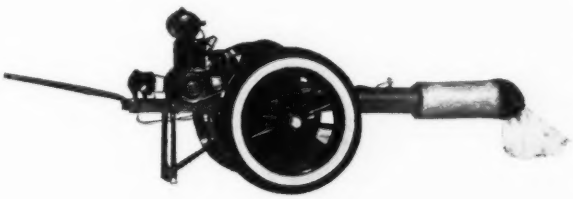
The new tractor has a ground clearance of 15 in., a drawbar height of 17½ in., and a lateral drawbar movement of 35 in. Standard equipment includes 18-in. grouser track shoes, while a complete line of attachments is available so that the machine may be adapted to any of a large number of specific uses.



The New Caterpillar D-7, 75-hp. Tractor

New Woolery Junior Weed Burner

DEVELOPED and introduced by the Woolery Machine Company, Minneapolis, Minn., the new Woolery Junior weed burner is a small portable unit especially adapted to the elimination of weeds in yards, around stations and buildings, side tracks, highway crossings, switch stands, interlocking systems, material storage yards and other locations. Moreover, its use is not restricted to weed burning for it is said to provide an efficient means of thawing snow and ice from switches, manhole covers, drainage pipes, culverts, interlocking plants, street crossings and hopper bottom cars.



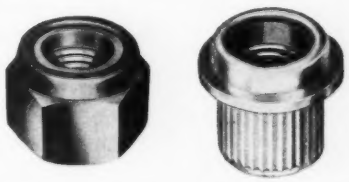
The Woolery Junior Weed Burner Is Rubber-Tire Mounted

Utilizing the same principles employed in the Woolery Giant Octopus line, the new machine is said to be efficient and economical in operation. It comprises a burner of the pressure-atomizing type, fuel pump and blower driven by a 2-hp. air-cooled gasoline engine with magneto ignition. The burner assembly is built on a steel angle-iron frame and mounted on a two-wheel chassis provided with 21-in. by 4½-in. pneumatic tires. The burner has a capacity of 2 to 20 gal. per hr. and the fuel tank is so placed in conjunction with the axle that the balance of the machine is not affected, regardless of the quantity of fuel oil in the tank. The entire unit weighs 300 lb. and is said to be balanced so that it may be handled readily by one man.

Designed especially for flexibility in use, the burner assembly and frame may be lifted from the chassis, after removing four bolts, and placed on a push car for burning weeds on branch or main line tracks. Burning a swath 5-ft. in width, the entire tie area of the track may be burned over by making a round trip with the burner.

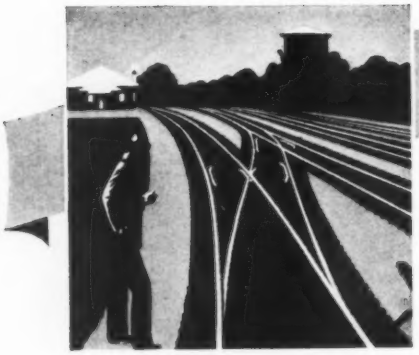
Nine New Types of Elastic Stop Nuts

THE Elastic Stop Nut Corporation, Elizabeth, N.J., has announced an expansion of its line through the introduction of nine new types of nuts, all of which embody the basic elastic stop self-locking element, a resilient non-metallic collar built into the head of the nut. In resisting the entrance of the bolt or screw, the collar forces the faces of the thread into a pressure-contact which is maintained after the nut is tightened. It is said that this action establishes a constant thread contact, eliminates thread play and holds the nut in position, regardless of the vibration, operating stresses or wear of surrounding parts that may take place.



Two of the Improved Types of Elastic Stop Nuts

The new types of nuts are designated as thin hexagonal, spline, internal wrenching, countersunk and counterbored one-lug anchor, countersunk and counterbored two-lug anchor, countersunk corner anchor, bracket anchor, floating right-angle anchor, and floating basket anchor nuts. Originally developed for pneumatic tools and other apparatus subject to heavy vibration, the nuts are now widely used on mechanical equipment and are available in any metal. With variations in sizes, thread systems and materials, 160 new standard items are offered of these stop nuts.



WHAT'S the Answer?

Meeting Trains with Motor Cars

When operating a motor car on a multiple-track line, should the car be stopped before meeting a train on the adjacent track? Why? Should the men dismount?

Must Slow Down

By P. F. Buckle
Superintendent of Safety, Chicago, Burlington & Quincy, Chicago

We have a maintenance rule on the Burlington which reads as follows:

When meeting a train in motion on another track, motor cars must slow down. This is to promote safety in case of derailment. Motor cars must slow down when passing a train that is standing, as men may step out from between cars and be injured.

This rule has been in effect for many years, and we have seen no reason for changing it since we have no record of any personal injuries having occurred as a result of the practice prescribed by the rule.

Doubtless something can be said in favor of stopping motor cars on multiple-track territory when meeting a train or when a train is passing, and the same is true of following the practice provided for in the rule that has been cited. In the first category comes the removal of the men from the zone of danger, that is, the hazard of objects falling from cars and of those thrown out by the air currents created by the train. Instances have been reported of men struck by objects falling from trains, despite the fact that they had removed themselves 20 to 30 ft. from the track, presumably a safe distance. In the second, if the motor car moves slowly while the train is passing, the period of exposure is lessened.

It is with this rule as with any other. It may seem to be somewhat arbitrary in its wording, yet no rule is of value unless it can be applied with common sense, and there is no rule in any code with which I am familiar that prohibits the use of common sense. In other words, if a train is approaching at high speed, and because of this speed the men on the motor car on immediately adjacent tracks will be exposed to unreasonable hazard, they should take suitable means to protect themselves. Our rule does not prohibit them from stopping the motor car and dismounting under such circumstances.

The Answer Is Yes

By Armstrong Chinn
Chief Engineer, Alton, Chicago

Motor cars operating on multiple-track lines should be stopped before meeting trains on adjacent tracks, and the men should dismount and stand in the clear of all tracks. This should be done for the following reasons:

There are usually flying particles of ballast and cinders in the air around a moving train and, to protect their eyes, the men on a motor car are likely to cover their faces. When they do this they are unable to see where they are going, with the result that they may strike an obstruction, another motor car, a vehicle or a train on the track on which they are moving. Again, flying particles of cinders and ballast raised by a passing train may injure the eyes of the men on a moving motor car.

Noises made by the passing train may make it impossible for men to hear the sound of a train approaching on the track occupied by the motor car. For this reason, they should dismount as soon as the car stops and stand in the clear of all tracks. All foremen and the men in their gangs should be in position to watch passing

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. *When spacing ties, should the distance be measured from center to center of the ties, or between the faces of adjacent ties? Why?*
2. *When a building is found to be infested with termites, what methods can be employed to get rid of them? How effective are these methods?*
3. *What precautions should be observed when loading or unloading rails to prevent accidents to trains on adjacent tracks and avoid injury to the men?*
4. *What defects are most commonly encountered in the under-water portion of masonry structures?*
5. *What considerations should be given weight in the selection of work equipment?*
6. *What effective means can be employed to prevent water hammer in pipe lines? What effect do elbows have? The diameter of the pipe?*
7. *When reballasting, should the track be raised on the old ballast, or should the old ballast be discarded to the bottom of the ties and only new ballast be used for making the raise? Why? Does the kind of ballast make any difference?*
8. *Should the hoops of wooden water tanks be loosened before painting the tub? Why?*

trains for defects. If any are noted, they should take such action as may be necessary to stop the trains before accidents occur. Men on moving motor cars are not able to do this.

Same on Single Track

By JOHN D. KIRKLAND
Track Supervisor, Chicago, Rock Island & Pacific, Fairbury, Neb.

When operating a motor car on one track of a multiple-track line the same precautions should be taken to protect against trains as on single track. However, if alinement and visibility are such that the operator can be positive that the oncoming train is on an adjacent track, or if the car is being operated under flag protection in the rear, then the car can be stopped, the men allowed to dismount and divide so as to make a standing inspection of the passing train. Under all other conditions, they should set the motor car off the track.

It is neither safe nor reasonable to assume that an approaching train is moving in the normal direction, since it is more or less common today to move traffic in either direction. For this reason, one should always consider the hazards of multiple track to be those of single track, so far as train movements are concerned, until absolutely certain that the approaching train is not on his track.

If the car is being used for trucking under full flag protection, it will be permissible to leave the car and loaded trailer on the track during the passage of the train. As before, however, the men should divide and make a standing inspection of the train during its passage. In this way both sides of the train will be inspected for hot boxes, dragging brakes and other defects, and the trainmen notified.

Repairing Waterproofing

Is it practicable to repair built-up waterproofing on solid-floor bridges without suspending traffic? If not, why? If so, how should the work be done? How can the waterproofing be renewed?

Difficult and Expensive

By M. HIRSCHTHAL
Concrete Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

Repairing built-up waterproofing is both difficult and expensive, particularly where it is necessary to maintain traffic during the period of repairs. For this reason, it is imperative that the original installation be made with meticulous care. All too often sharp-edged or pointed tools or heavy materials are dropped on the waterproofing before the protective cover is placed, so that the fabric is punctured. It is difficult to find a puncture of this kind, and the damage is usually covered up by the protection layer, only to make its presence known some years later when water has found its way through the puncture and to an exit at a construction joint.

Whether it will be necessary to interfere with traffic will depend on several conditions. If the structure is for single track, it will be essential that the repairs be made under traffic, and where necessary the track will have to be carried temporarily on blocking. There are many instances where there is no possibility of determining where the water has gotten through the waterproofing until it has been uncovered and examined carefully. On the other hand, some failures can be traced and the repairs made without interfering in any way with traffic. Such cases occur particularly where the waterproofing protection along parapets or curbs, or along the edges of platforms, has bent or torn away from the concrete, carrying the waterproofing itself with it, thus leaving the surface unprotected. This is likely to occur more particularly where mastic has been used for protecting the vertical or nearly vertical surfaces at parapets or curbs, where it is exposed to the heat of the sun's rays. In such cases the repairs are rather simple in character, consisting of patching, with proper laps, the built-up waterproofing blanket with similar material and of replacing the protection with dense brick.

Waterproofing failures often occur in station platforms, particularly those having canopy columns, when both the waterproofing and the protective coat are carried up the sides of the platform curbs and the column bases to a height of 12 or 15 in. Generally, a cinder fill is brought up to the elevation of the underside of the platform slab, which rests upon this fill and has the usual joints in both directions. Water finding its way through the joints saturates the cinders and when this water reaches a level above the waterproofing it will find a way behind the waterproofing to some vulnerable point in the concrete, such as an unprotected construction joint, and a leak becomes evident.

Such a failure can be repaired only by tearing up a part of the platform and removing the cinder fill. The remedy will then be either to clean and prime the surface from which the waterproofing has been loosened and make it adhere by means of a new bituminous coating, with the addition of one or more plies, and by eliminating the cinder fill to prevent a recurrence; or by carrying the waterproofing up to the underside of the platform slab and over its supports, as well as to the full height of and over the top of the column bases.

If the failure occurs directly under a track, and there are two or more tracks in operation, it may be feasible to cut one out of operation temporarily, taking up the track and removing the ballast. If this is not permissible, the track must be carried on stringers supported on blocks. The ballast is then removed and the waterproofing examined for punctures or to determine whether a complete replacement is necessary. In the latter case, a priming coat should be given to the thoroughly cleaned concrete surface and an extry ply of fabric placed over those joints that have leaked. The priming coat is mentioned because it is generally optional, as one school prefers to install the waterproofing in such a way that it does not adhere to the concrete. Where this has not prevented the leak, it may be wise to secure adhesion by means of a priming coat.

Can Be Done

By GENERAL INSPECTOR OF BRIDGES

It is entirely practicable to repair or renew built-up waterproofing under traffic, but it may be extremely difficult to do so. In any event it will be expensive. These facts indicate the desirability of exercising the utmost care when making the installation to insure against defects and damage, for most failures can be traced to poor workmanship or carelessness on the part of some workman. Waterproofing materials are generally purchased under rigid specifications and inspection, but this care in the selection of the materials can be nullified completely by an apparently inconsequential action on the part of a single member of the waterproofing gang. This indicates the importance of experienced supervision, not only in the

original installation, but in making both repairs and renewals.

If the work is to be done under traffic, the track should be carried on one or more stringers under each rail, which are supported on blocks that rest on the floor. The ballast should then be shoveled out so that a search for the leak can be made. If one is reasonably certain of its location, it may be necessary to remove only a small amount of ballast, or to block up only a small length of track. After the leak is found, it should be patched in the usual manner by mopping on plies that extend progressively wider as the number increases. The protection coat should then be restored.

If the waterproofing is in such shape that it requires renewal, both the protective coating and the waterproofing blanket should be removed and the original surface should be cleaned and primed. The new application should be made in exactly the same manner as if it were a new job. The principal difficulty will be to do the mopping and apply the fabric, because of interference by the timbers and blocking that are used to support the track, and this is one of the items that makes work of this kind so expensive. The blocks will have to be removed temporarily and restored, but extreme care must be exercised to insure that all plies are bedded properly in the hot bitumen and that the fabric is not punctured.

Failure in Switch Ties

What are the causes of failures in switch ties? What can be done to retard these failures?

Wear Has Decreased

By A. B. Hillman
Engineer Maintenance of Way, Chicago & Western Indiana, Chicago

It is not many years since mechanical destruction was the largest factor in determining the life of a switch tie. This was true to such an extent that many maintenance officers considered that the preservative treatment of switch ties was an unwarranted expense. This form of destruction was brought about by the frequent spiking necessary to the adjustment of the gage at the point, through the closure rail and at the guard rail; by the use of switch plates and tie plates that were too small; and by continually spiking frogs to hold them in place. In yards, the respiking of the entire turnout because of frequent derailments, and the cutting and splintering of the ties by derailed wheels not only damaged the ties directly, but tended to accelerate the process of decay.

In recent years there has been real progress in the reduction of these forms of destruction until at present it is deemed economical to give switch ties preservative treatment. This situation has been brought about by increasing the area and thickness of switch plates and tie plates; by the use of adjustable braces and gage rods to maintain gage; by the development of better methods of holding guard rails and frogs in place; by improved designs of switch points; and, not least of these improvements, by the use of heavier rail for turnouts.

Damage to switch ties by derailments in yards is still a serious problem. However, the use of heavier materials has done much to eliminate derailments resulting from track defects. The use of automatic switch stands, which allow switches to be run through without damage to the points, has been a further aid in preventing accidents, and has thus increased the life of switch ties. Where ties have been damaged by derailments, the crushed fibres should be adzed away and the surface should be coated with hot creosote.

Keep Standards High

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

As with crossties, some of the failures in switch ties can be traced to poor inspection or the acceptance of woods not suited for this service. I assume, however, that the question refers primarily to those forms of failure for which the maintenance forces are wholly or partly responsible. Not infrequently, switch ties sustain irreparable damage through errors of installation. No spike should be driven until it is certain that it is being placed where it belongs. Both the main running rails and the turnout rails should be lined correctly before they are spiked. Gage plates, riser plates and tie plates should be located correctly and the spacing and length of the ties should be checked carefully before they are spiked. Pulling and redriving spikes when putting in a set of switch ties is not only unnecessary, but it starts them out on their service life in damaged condition.

Light rails, light fastenings and light switch fixtures are direct causes of tie failures and indirect causes by reason of increased derailments. Creeping rails may cause more damage to switch ties than most of us realize, while blocked drainage, sloppy track, neglect of gage, failure to keep good line and surface, as well as other forms of neglect all combine to shorten tie life.

Switch ties are subject to severe service, even where through movements predominate. As the turnout traffic increases, the severity of the service also increases. However, much of the abuse to which switch ties have been subjected in the past can be eliminated by higher standards of track construction; that is, by heavier rail, heavier fastenings and heavier switch fixtures. Similarly, careful attention to ballast, drainage, line, surface and gage, as well as to adzing when needed, will go a long way toward conserving the life of switch ties.

Caused by Damage

By F. E. McMannis
Supervisor of Track, Central of New Jersey, Somerville, N. J.

Considering only creosoted timbers, switch ties fail largely by reason of mechanical damage and splitting. Mechanical destruction is particularly severe at frogs, where they must resist the pounding of the wheels and considerable lateral thrust. At guard rails particularly, and to only a slightly less extent at frogs, and on the turnout rails, it is usually necessary to respike frequently, so that the ties become virtually spike-killed. At turnouts on curves, the low rail of the main track cuts deeply into the ties, requiring adzing to reseat these rails, ultimately calling for renewal of the ties.

Better designs for modern track fastenings have done much to retard these failures. Larger switch and tie plates help greatly. Incidentally, the use of hook flanged plates under frogs provides a better means of securing the frog to the ties and eliminates the too frequent tendency to slip a small tie plate under the frog when the rigidly attached plates do not fit the tie spacing. Again, double-shoulder guard-rail plates and an improved type of gage plates, together with adjustable braces, help to eliminate excessive respiking of guard rails and switches. It is particularly advantageous to use self-guarded frogs, and

thus eliminate the use of guard rails.

Splitting, which is responsible for many switch-tie failures, is more evident in some kinds of timber than in others. Obviously, the better timber in this respect is the most desirable, and the use of anti-splitting irons is helpful. However, the large number of spikes necessary in switch ties cannot but accentuate the natural tendency of the timber to split, and the best means to reduce the effect of the spikes is to bore the timbers before the spikes are driven.

Preframing Building Lumber

Is it practical to preframe the lumber for small standard buildings? If not, why? If so, what are the limitations? What are the advantages?

Is Entirely Practical

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Experience has shown that it is entirely practical to preframe all of the lumber for small standard buildings. The limitations of doing this will depend largely on the design of the structure. When applied to small buildings, such as telephone booths, toilets, coal bins, tool houses, and even freight and warehouses, which do not require a large amount of mill work or fine finish lumber, a large saving can be made in labor costs, provided power tools and a wood shop are available, while some saving is always possible through reduction in the amount of waste material.

In general, when material is shipped from a lumber yard, it is furnished in various lengths, and in many cases it becomes necessary to waste considerable material on the job, that could have been avoided by having the right lengths. Again, preframed lumber requires considerably less shipping space and less handling than the rough material, and can be erected in much less time. It is important, however, to place short lengths of lumber in securely tied bundles to avoid damage as well as to save time in selecting the pieces for the various parts of the building.

It is not practical to provide every carpenter gang with the complement of power tools necessary to frame the lumber for a building after it is delivered on the ground. Where a central shop is maintained, however, say at division headquarters, one set of woodworking tools will be sufficient for all gangs. In other words, one or two men can do the preframing and send the framed material to the gang that is to do the erecting. Small buildings for which the lumber has been preframed and shipped to the point of use can be erected by one carpenter and a helper. If it were necessary to frame the material on the job, a foreman and several carpenters would probably be required.

Is Easy to Do

By S. P. Shafer
Engineer, Chicago, North Shore & Milwaukee, Highwood, Ill.

It is not only practical but economical to preframe lumber for small standard buildings. For example, material for shelters for use at outlying points is cut in the carpenter shop and given a priming coat of paint before it is shipped to the point where the building is to be erected. Roof boards are not cut to exact length, but are left a few inches long to allow for slight variations in overall dimensions, and to insure that the roof line will be straight. For the same reason we do not cut the sills to exact length for we have found that it is not always possible to set the foundation posts accurately. Smaller buildings, such as flag shanties, telephone booths, etc., are built complete in the carpenter shop and painted. They are then delivered to the desired location by either truck or train.

While there are a number of advantages in preframing the material for small standard buildings or in building and painting them in the shop, the most important are (1) waste is reduced to the minimum, since the men in the shop are able to select the lumber to get the most out of each stick; (2) the labor cost is less, for the shop is equipped with wood-working machines that shorten the time required for fabrication, compared with hand cutting; and (3) the structure or its component parts can be painted immediately. In other words, protection from the ill effects of weathering starts as soon as the pieces are cut or the building is completed. We all know how difficult it is to get a paint gang to some remote point for the purpose of painting one lone small building. The tendency is to let the job go until there is enough work in the immediate vicinity to warrant sending the gang. The result generally is that by the time they get on the ground deterioration has set in.

Supervisor and Foremen

Should a supervisor go over his sections in detail with the foreman? Why? If so, how often? Should this be on foot or on motor car?

Should Do So

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punsutawney, Pa.

Other things being equal, the best supervisor is the one who keeps in closest touch with the conditions on his district and with the progress of the work in his charge. He knows his territory and what is going on. To do so, however, he must go over his sections in detail with his foremen. No two foremen and no two sections require the same amount of attention from the supervisor. It may be necessary to go over some sections on foot with the foremen quite often. Other sections or foremen will require such trips only once or twice a year. In any event, the supervisor should be in contact with his foremen often enough to give them verbal instructions as to their duties, using written instructions as little as possible. This makes the use of the motor car advisable and in many cases compulsory.

Whether on foot, by motor car or on trains, the supervisor's trips should never be according to schedules. Foremen will soon learn a schedule and govern themselves accordingly. A supervisor should be at the section headquarters occasionally at starting time and go out with the gang. In this way he will find out how the day's work is planned by the foremen. There is no disgrace in checking or in being checked.

There can be no set rule as to how a supervisor shall cover his territory. The main thing is that he know his district intimately, that his foremen

are efficient in the performance of their duties, and that they are doing first things first. If he does this, he will be the best supervisor, regardless of the manner in which he gets over his territory.

Believes in It

By L. D. Gardner
Roadmaster, St. Louis-San Francisco, Tulsa, Okla.

I am definitely of the belief that supervisors should go over their sections in detail with their formen. This will keep both the supervisor and the foremen in closer touch with track and roadway conditions. This ought to be done at least twice a year, once in the spring when the season's work is starting, so that they can plan the program for the year, and again during the early fall to check what has and has not been done, as well as to plan the fall and winter work. These trips certainly should be made on foot. When a supervisor goes over his section on foot he sees a lot of things that he will miss from a motor car, and he can do a much better job of inspecting ties, surface, line, gage, rail, ballast, right-of-way fences, drainage and other items that are to be looked after.

Good for Both

By E. A. Eastin
Supervisor of Track, Chesapeake & Ohio, Peru, Ind.

It is to the advantage of both the supervisor and the section foreman that they go over the section in detail together, for the supervisor will learn first hand many things about his track and roadway that he might not learn otherwise, while the foreman will benefit through a better appreciation on the part of the supervisor of his needs, particularly with respect to materials. How often should this be done? This will depend largely on climatic and local conditions, but I would say a minimum of three times annually. The first trip should be made about the time the frost is going out, at which time the early work can be planned; the second, about midsummer, when the heavy work of the season is under way; and the third, in the fall when the track is being made ready for winter.

While a supervisor should make as many trips as practicable by motor car over his district, it is not necessary, except occasionally for some special reason, to take the foreman with him. However, the special inspection trip should be made on foot, and should be unhurried. If a supervisor familiarizes himself with every section in this manner, he will always be in position to advise his foremen intelligently when they stand in need of such advice, and he will also be able to answer questions asked by his superior officers.

I believe also in getting the foreman's opinion on matters pertaining to his work. His judgment is generally sound, but if he is following undesirable practices or is mistaken in some matter of judgment, it is much easier to educate him to the proper methods if he believes you have some confidence in him. Any man who feels a sense of responsibility will be a better foreman than one who has been taught to lean wholly on his superior.

Causes of Alligatoring

What causes paint to alligator? What measures can be taken to overcome the trouble?

Soft Undercoats

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

The principal cause of alligatored paint is a soft undercoat which, when it shrinks during the drying or hardening process, causes the overlying coat to check. This checking usually penetrates to the full thickness of the outer film, leaving the surface sensitive to weather influences, which generally results in an unsightly appearance or an early complete failure. When painting new wood surfaces, three coats should be applied; the first or priming coat should contain more oil with respect to the pigment, and more turpentine than succeeding coats. This permits the oil to soak into the wood and fill up the pores, leaving a film having a high pigment content. This coat should be allowed to dry thoroughly—at least two or three days—before the second coat is applied. The second coat should be slightly softer and more elastic than the first or primer coat and, to insure a perfect job, it too should be allowed to dry thoroughly before the third or finish coat is applied. The third coat should contain more oil to provide greater elasticity and a higher gloss.

To prevent alligatoring, each coat should be slightly softer than the preceding one, and it should be permitted to dry thoroughly before it is covered with the succeeding coat. Paint that has alligatored should be removed before the surface is repainted; otherwise an inferior job will result. When removing the old paint with a torch, care must be exercised to avoid scorching or burning the wood. If this does occur, the burned spots should be sandpapered to clean wood, for otherwise the new paint will have a spotted appearance that may be as bad as that of the alligatored surface. Since the purpose of the paint is as much to improve the appearance of the structure as it is to protect it, it is always good policy, and also more economical in the long run, to pay special attention to the quality of the material and to the employment of experienced and expert workmen.

Proves Old Adage

By General Inspector of Buildings

Alligatoring is a fine example of the truth of the old adage that careless haste makes wanton waste, for, in railway service this defect generally results from an effort to get too much work done in a given time, usually instigated by some officer who possesses a profound ignorance of the principles underlying painting. It may be all right to "whoop it up, boys" and renew a lot of ties or renew a lot of rail in a short time, but when it comes to natural processes it is usually beneficial to follow nature's tempo.

Alligatoring results from two causes, both of which are basically the same, namely, from applying a coat of paint over another that has not been given time to dry thoroughly, or over one that is soft because it has not been formulated properly. This is equally true of varnish; in fact, varnished interiors seem to suffer from this trouble in about the same degree as outside painted surfaces. Checking and alligatoring are only different manifestations of the same basic trouble.

Priming coats on wood surfaces should be rich in oil and should be

well thinned with turpentine to insure penetration of the wood. The pigment should have low absorptive capacity; otherwise the pigment will take up too much of the oil and the coat will remain soft. One of the essentials of a satisfactory priming coat, on either wood or metal surfaces, is that it shall be hard, but elastic enough to respond to expansion and contraction of the surface without rupturing. The second or body coat should be slightly less hard than the priming coat and the finishing coat should have the greatest elasticity.

Each coat, in turn, should be allowed to dry thoroughly before the next coat is applied. All paint shrinks as it dries. If a coat of paint is applied over partly dried paint, the drying process is stopped in the paint so covered, but the coat last applied, being exposed to the air, dries rather quickly—and shrinks. When the undercoat again starts to dry it simply ruptures the outside coat and we have the appearance of an alligator hide.

Too many times the painting forces are under pressure to get their work done in a hurry because some one wants to make a showing or is afraid that appropriations will expire or be withdrawn. As a consequence, they apply succeeding coats before prior coats have been allowed to dry properly. I have seen whole divisions that suffered from this defect because some of its officers were after records of volume of work in the minimum of time, and the paint foreman was blamed for turning out a poor quality of work or of using inferior materials. There is no economy in hurrying this class of work unduly, for checked or alligatored paint must be removed to the bare wood or metal before the surface can be repainted with any possibility of success.

Starts with Checks

By L. R. Pennington
Supervisor Bridges and Buildings, Chicago & North Western, Pierre, S. D.

This defect starts first as checking in the form of fine interlacing lines on the surface of the paint, but shortly before the paint film ceases to give adequate protection, it begins to take on the appearance of alligator skin. Both the checking and the alligatoring are likely to be from the same cause, namely, a hard unyielding coat has been applied over a softer undercoat. While the undercoat may apparently be perfectly dry before the finishing coat is applied, the drying process continues and, since the finishing coat is exposed directly to the air, it dries more quickly and contracts or shrinks as it dries. This causes ruptures of the outer coat and produces checking or alligatoring. To avoid this, the undercoat should be as dry and hard as practical before it is covered by the succeeding coat. A surface that has checked or alligatored should not be repainted, as the appearance will be rough and unattractive; the old paint should be removed before repainting.

Long or Short Guard Rails?

What are the relative merits of long and short guard rails opposite frogs?

Cites A.R.E.A. Standards

By F. A. Bishop
Engineer Maintenance of Way, Toledo Terminal, Toledo, Ohio

In general, the guard-rail length and settings recommended by the A.R.E.A. will protect frog points adequately to prevent derailments. Three guard-rail lengths, namely, 8 ft. 3 in., 11 ft. and 13 ft., are recommended for the protection of both rigid and spring frogs from No. 4 to No. 20. In certain cases, from the standpoints of both safety and economy, we have found it advisable to use a longer guard rail than recommended by the A.R.E.A. for a given frog number.

Longer guard rails are justified to protect frogs throughout their entire length on the high side of curves and at turnouts from main lines, which carry very heavy traffic, since frogs are much more expensive than guard rails. If they are not protected throughout their full length, frogs will become worn at the heel and toe, while that part of the frog near the point will show very little evidence of wear. A long guard rail kept in accurate adjustment will take a large part of the wheel thrust and correspondingly relieve the frog, thus resulting in a much longer life for the frog, as well as uniform wear from the heel to the toe.

Longer guard rails at these heavy-traffic points and on curves, provide a better opportunity for fastening the guard rail, for the load can be distributed over more switch ties. Two or three clamps can be added where justified. The additional support decreases materially the pressure on the individual fastenings and thus lengthens their service life. The better opportunity thus given for distributing the load over more ties has a tendency to increase tie life. In a few cases we have found it advantageous to install longer guard rails at crossovers in both tangents and curves, particularly where these crossovers are adjacent to main-track connections. These longer guard rails were installed to handle safely heavy engines with long rigid wheel bases, since they assist in lining up the engine wheels before they reach the frog points. These installations have enabled us to defer the construction of longer crossovers at the points where they have been installed. In no case, however, where we have installed the longer guard rails, have we found it necessary to use anything but our standard lengths, thus avoiding the fabrication and carrying in stock of special-length guard rails.

Both Have Merits

By W. H. Koch
Roadmaster, Delaware & Hudson, Oneonta, N. Y.

Both long and short guard rails have merits. Guard rails as short as 8 ft. may be used safely at either spring or rigid frogs up to No. 12, provided the fastenings are adequate, that is, guard-rail plates combined with guard-rail clamps. Or large heat-treated bolts and filler blocks in sufficient number to hold them firmly to gage can be used with spring frogs from No. 12 to No. 20. On the other hand, guard rails as long as 15 ft. should be used on the rigid side of the frogs to keep the wheels from exerting lateral pressure against the spring rail, especially on single track or at facing-point turnouts on multiple tracks.

There are some cases where a long guard rail should be used on manganese-steel or other rigid frogs, this being where the turnout leads to the outside of a curve that is 4 deg. or sharper. In these cases the guard rail should protect the frog for its full length to prevent flange wear, particularly if the frog has a manganese insert. The carbon rails will soon show considerable flange wear, although the manganese insert will show no flange wear, thus creating a bad line through the frog, which can be corrected only by replacing the frog.

Formerly, almost all roads used guard rails 15 ft. long, and the practice has not been given up entirely

on a few roads. This was in the days before guard-rail clamps, long tie plates and other devices to hold the guard rail in place had been developed. Because the only method then available to hold the guard rail in place was to bolt it and spike it, this length was required to get sufficient bolts and spikes in place to hold the guard rail to gage. With the various fastenings or devices now available for holding the guard rail rigidly in place, including several good designs of one-piece guard rails, almost any length of guard rail can be used that can be held to gage and that is suitable for the place where it is to be used. This means that the material for the guard rail and fastenings must fit the rail that is being used in the turnout, and must be suitable in other ways to meet the requirements of the situation.

Pipes Freezing When Thawing

Is there danger of underground pipe lines that have remained open during the winter, freezing during spring thaws? Why? What can be done to overcome the trouble?

Provide Dead Air Space

By C. R. Knowles
Superintendent of Water Service, Illinois Central, Chicago

Underground water lines should be laid below the frost line, which in the northern states and Canada may be as deep as 7 ft. Under certain conditions exceptions may be made where constantly high velocities of flow are maintained. The temperature of the water obtained from surface supplies is seldom less than 33 deg. F., as the formation of ice on the surface and the density of the water usually prevent the lowering of the temperature below this point. If the temperature is reduced below 32 deg., ice will begin to form on the inside perimeter of the pipe. Frazil ice may form with the temperature below 32 deg. if the water is in motion. A reduction in the velocity of flow may cause this frazil ice to flash into solid ice if the motion of the water is interrupted, and this may occur regardless of the fact that a thaw may be under way.

The clogging of pipes with ice after a thaw is sometimes caused by the film of ice, which has formed during lower temperatures, coming loose from the wall of the pipe. This film may break up and flow through the pipe until it reaches a point where the ice is still intact or its passage is blocked in some other way. At this point it will become packed so solidly that the flow is stopped completely. It is also possible that the alternate thawing and freezing of the ground may cause it to become saturated, thus causing the pipe line to freeze, since freezing depends upon the saturation of the material around the pipe as well as the velocity of flow. The most effective method of preventing the freezing of pipes is to provide a dead air space around them, such as voids in a rock fill. Pipes in rock trenches filled with dry back fill are less likely to freeze than those laid in a moist compact soil.

No Mystery

By Engineer of Water Service

This is a phenomenon that occurs quite often in the northern states and Canada where long-continued low temperatures prevail, but does not seem to be well understood, as the idea is sometimes expressed that the high temperatures that cause the thaw drive the frost deeper into the ground. It should be understood, however, that there is neither attraction nor repelling action between heat and cold, as there is between opposite or similar poles of a magnet. As a matter of fact, the explanation is far more simple and will be understood readily if one remembers that in its transmission heat follows the laws of flow in the same ways that liquids, steam, compressed air, electricity, etc., do.

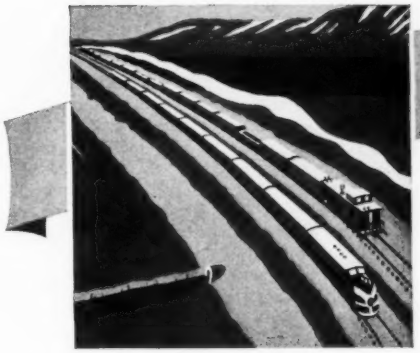
Heat always flows from one object of higher temperature to another of lower temperature, and physicists compute the rate of flow by multiplying the difference in temperature between the two objects by the heat conductivity of the substance separating them, this rate being expressed in heat units per second. The heat unit generally employed in these computations is the British thermal unit, which is the amount of heat required to raise one pound of water one degree Fahrenheit, and is generally designated one B.t.u.

During periods of low temperature the temperature of the ground at and near the surface is lower than that of the earth below the surface, so that there is a steady flow of heat from the earth to the surface. This constant drain diminishes the heat stored in the ground, and, therefore reduces its temperature. Eventually, if the weather remains cold, this reduction reaches the point where the temperature of the ground is below freezing for a considerable depth below the surface. Obviously, any water pipes in this zone of frozen earth will become frozen unless they are well insulated or the temperature of the water is well above the freezing point and the velocity of flow is sufficient to prevent enough loss of heat to insure against freezing.

With the return of warmer weather, with atmospheric temperatures well above freezing, the surface of the ground will be heated and heat will flow from the surface to the frozen zone below. At the same time however, heat will continue to flow from the warmer earth underneath to the frozen layer. In other words, despite the mild weather and the thawing at the surface, the frost is striking deeper. In the course of time, the frozen layer will be thawed out, but before this the continued abstraction of heat from the earth may increase the depth of the frozen zone to such an extent that it will reach and freeze water lines that are supposedly at a safe depth.

An example of what I have in mind occurred on a line where temperatures remained consistently below freezing for long periods and often fell to 40 or more degrees below zero. I have seen a number of instances of pipe lines freezing late in the spring. In one case that I remember, this occurred about the middle of May, at a time when farmers were beginning to work in their fields. The pipe was slightly more than 8 ft. below the surface. When it ceased to function after the plant had been idle over night, we dug down to find the trouble. We encountered frost at a depth of 4 ft. and the ground was frozen from there to the pipe. It is practically certain that if the plant had been in continuous operation this stoppage would not have occurred, even though the water was being taken at low temperature from a reservoir.

Obviously, the most certain protection is to place the pipes below any possible frost action. If this is not practicable, the water should be kept flowing during the critical period. If the supply is obtained from wells at a relatively high temperature, say 50 deg. or higher, it is unlikely that the line will freeze over night. If however, the water is obtained from a surface supply and its temperature is not much above freezing to start with, the pipe may become frozen within a few hours, the time depending largely on the diameter.



NEWS of the Month

Frisco Brightens Its Freight Cars

In order to add distinction to its fast merchandise trains, the Flashes, the St. Louis-San Francisco is replacing the conventionally painted cars in these trains with cars painted in bright hues. The new paint scheme consists of light tan on the bodies, dark brown on the doors, ends and roofs, and vivid orange lettering and markings.

Phillips Elected Head of Railway Labor Executives

James A. Phillips, president of the Order of Railway Conductors and vice-chairman of the Railway Labor Executives Association, has been elected chairman of the latter organization to succeed George M. Harrison, president of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees, who resigned because of the press of other duties.

Three Roads Construct Pendulum Cars

Three pendulum type passenger cars, which are designed with a special suspension system or method of mounting the car on the truck in a plane above the center of gravity of the car, are being constructed, one each for the Atchison, Topeka & Santa Fe; the Great Northern and the Chicago, Burlington & Quincy, by the Pacific Railway Equipment Company. The cars will be operated as a single train by the owning railroads in experimental service.

January Operating Revenues 12.4 Per Cent above 1939

Preliminary reports from 87 Class I railroads, representing 82.6 per cent of total operating revenues, show that those roads in January had estimated operating revenues amounting to $283,972,927, compared with $252,650,398 in the same month of 1939, and $364,086,551 in the same month of 1930. The January gross was 12.4 per cent above that for January, 1939, but 22 per cent below January, 1930.

Freight revenues of the 87 roads in January amounted to $232,287,837, compared with $202,931,457 in January, 1939, and $274,139,268 in January, 1930—14.5 per cent above the former but 15.3 per cent below the same month in 1930. Passenger revenues totaled $29,914,405, compared with $29,264,727 in January, 1939, and $58,207,609 in January, 1930—2.2 per cent above the former, but 48.6 per cent below the same month in 1930.

Employment 6.12 Per Cent Above 1939 in January

According to the Interstate Commerce Commission's compilation based on preliminary reports, using the 1923-1925 average as 100, and corrected for seasonal variation, railway employment in January stood at 56.8, with 988,870 at work. This was 6.12 per cent higher than January, 1939, although it was a 2.05 per cent decline from the previous month. Employment of all groups was above that of January a year ago. As compared to December, 1939, the largest decrease, 5.63 per cent, was in the maintenance of way and structures group.

Rail Labor Opposes St. Lawrence Seaway

The executives of six railroad labor organizations have recently requested members of the Senate by letter to oppose the St. Lawrence seaway, a project which has been revived by the administration. The letters received by the senators contained an analysis of the St. Lawrence project, which briefly described the project and discusses its prospective traffic. Concerning the effect of the project on other forms of transportation it says, "there is today no inadequacy of transportation facilities—our facilities for land transportation are fully adequate to provide efficient service for almost any conceivable amount of business" and continues with a plea for reducing public expenditures for rival forms of transportation which would further cripple the railroads, adding, "A large part of the indebtedness of our federal, state and local governments has resulted from the construction of modern highways. Under such circumstances, it is worse than inconsistent that the United States undertake further expenditures to add to our oversupply of transportation facilities."

Burlington to Add Three New Zephyrs in 1940

The Chicago, Burlington & Quincy will add three new streamlined Zephyr trains to the nine already placed in service, in 1940. One train, which will be placed in service early in the spring, will supplant the Pioneer Zephyr, operating on a daily round trip schedule between Lincoln, Neb., and Kansas City, Mo., via Omaha, Neb. The Pioneer Zephyr will then be placed in service on another division. The other two new Zephyrs, which will be completed in mid-year, and which will be named the Texas Zephyrs, were recently ordered and will be placed in overnight service between Denver, Colo., and Fort Worth, Tex., and Dallas.

Export Traffic Soars

Total export traffic, except grain, for the month of January at Atlantic and Gulf ports was 42 per cent higher than in the same month a year ago and the number of tons of export freight lightered at the port of New York in January was 91 per cent higher than in January, 1939, according to a report of the Association of American Railroads on February 19, which also said "Due to operation of the plan set up last November by the railroads in co-operation with shippers, exporters, steamship owners and port authorities—this increase is being handled smoothly and with no evidence of delay."

Streamliners Get the Business

According to an 82-page report prepared by Coverdale & Colpitts, consulting engineers, New York, for the Edward G. Budd Manufacturing Company, Philadelphia, Pa., which was issued in February, the statistics of 100 streamlined, lightweight high-speed passenger trains show without doubt that they are highly popular and proven financial successes. The report covers traffic and earnings of selected trains for the years ended June 30, 1938 and 1939, continuing the figures of a basic report dated June, 1938, which was reported on page 789 of the December, 1938 issue of *Railway Engineering and Maintenance*. As of June, 1939, the Santa Fe, with 15 separate trains, operated the largest fleet of streamliners. The two Daylights of the Southern Pacific, operating between Los Angeles, Cal., and San Francisco, earned $5.28 per train-mile during the year ended June 30, 1939, which exceeds the "take" of any other train during the period covered in the report. The highest ratio of net revenue to gross of any train in the report is found in the figures for the two afternoon Hiawathas of the Chicago, Milwaukee, St. Paul & Pacific operating between Chicago and the Twin Cities, which cleared 75.7 per cent of the gross for that year.

Personal Mention

General

J. B. Jones, division engineer of the St. Louis division of the Pennsylvania, with headquarters at Terre Haute, Ind., has been promoted to assistant superintendent of freight transportation on the Central region, with headquarters at Pittsburgh, Pa. A sketch of Mr. Jones' career was published on page 188 of the March, 1939, issue of *Railway Engineering and Maintenance*, shortly after his promotion to division engineer.

William Homer Tobey, superintendent on the Canadian National, with headquarters at Prince Rupert, B.C., and an engineer by training and experience, has been appointed general manager of the Pacific Great Eastern at Vancouver, B.C. Mr. Tobey was born at North Berwick, Me., on January 15, 1880, and attended Brown University. After serving as a rodman with Aspinall & Lincoln, civil engineers

William Homer Tobey

of Boston, Mass., and as a transitman with the Hudson River Water Power Company in New York State, he entered railway service in 1902 as a transitman on the Wabash, Pittsburgh Terminal (now the Pittsburgh & West Virginia) in West Virginia. In 1904, he went with the Canadian Pacific as a resident engineer and in 1906, he went with the Grand Trunk (now the Canadian National), serving successively as resident engineer and assistant engineer until 1914, when he was appointed resident engineer maintenance of way, with headquarters at Prince Rupert, B.C. In 1925, Mr. Tobey was promoted to superintendent at Prince Rupert, the position he held until his recent appointment.

Victor R. Walling, whose promotion to superintendent of the Chicago & Western Indiana, with headquarters at Chicago, was announced in the January issue, was born at Tripoli, Iowa, on May 24, 1880, and graduated in civil engineering from Kansas University in 1901. He entered railway service in June, 1901, as a draftsman for the Cananea Consolidated Copper Company's railway at Cananea, Sonora, Mex., later serving as instrumentman on the Southern Pacific and on January 15, 1903, returning to the Cananea Consolidated as first assistant engineer. On

Victor R. Walling

March 1, 1907, he was advanced to chief engineer and on August 12, 1907, to superintendent and chief engineer. On June 20, 1912, Mr. Walling went with the Chicago & Western Indiana as first assistant engineer, with headquarters at Chicago, and three years later he was appointed principal assistant engineer, in charge of construction, track elevation and maintenance. In the spring of 1933, he was appointed engineer of maintenance of way of both the C. & W. I. and the Belt Railway of Chicago, the position he held until his recent promotion. For a number of years, Mr. Walling has been active in the Maintenance of Way Club of Chicago, and served as president of that organization in 1936.

John W. Wheeler, who resigned as assistant chief engineer of the Burlington Lines, with headquarters in Chicago, on May 11, 1939, to take charge of contracting work for the Cities Construction Company, Hammond, Ind., has been appointed executive assistant of the Burlington Lines, a newly created position, with headquarters at Chicago. Mr. Wheeler

John W. Wheeler

was born at Crown Point, Ind., on May 31, 1893, and graduated in civil engineering from Purdue University in 1916. On May 20, 1916, he entered highway service as project engineer for the highway department of Vermillion County, Danville, Ill. After several years in highway engineering and contracting work, he was appointed state highway commissioner of Indianapolis on February 14, 1933. On January 15, 1937, he was made engineer of highway negotiations of the C. B. & Q., with headquarters at Chicago, and in November, 1938, he was promoted to assistant chief engineer of the Burlington Lines. He resigned on May 11, 1939, to engage in contracting work. His appointment as executive assistant was effective February 15. Mr. Wheeler was also chairman of the Indiana State Planning Board from 1934 to 1938, and has been a director of the Chicago Regional Planning Association since 1934, and a member of the Board of Trustees of Purdue University since 1934.

William W. Judson, division superintendent of the Northern Pacific at Missoula, Mont., and an engineer by training and experience, has been promoted to general manager of the Lines East of Livingston, with headquarters at St. Paul, Minn. Mr. Judson was born at Rochelle, Ill., on

William W. Judson

March 24, 1891, and attended Knox College, Galesburg, Ill., and Dartmouth College, Hanover, N.H. He entered railway service in 1911 in the engineering department of the Spokane, Portland & Seattle, and in 1914, he went with the Northern Pacific as a rodman, later serving as instrumentman and assistant engineer in the engineering department at Centralia, Wash. In 1917, he jointed the United States Army, becoming a first lieutenant in the transportation corps, and serving in France for 15 months. In 1919, he returned to the Northern Pacific, serving as an assistant engineer on maintenance and construction work until 1927, when he was assigned to the position of special assistant to the operating vice-president at St. Paul. Two years later he was promoted to trainmaster on the Pasco division at Pasco, Wash., later being transferred successively to Spokane, Wash., and Seattle. In 1933, he was advanced to assistant to the general manager, with headquarters at Seattle, and on June 1, 1936, he was promoted to superintendent of the Yellowstone division, with headquarters at Glendive, Mont., later being transferred to Missoula.

W. C. Sloan, general manager of all lines of the Northern Pacific, with headquarters at St. Paul, Minn., and Seattle, Wash., and an engineer by training and experience, has been promoted to assistant vice-president in charge of maintenance and operations and general manager of Lines West of Livingston, Mont., with headquarters at Seattle. Mr. Sloan was born at Brooklyn, N.Y., on July 9, 1886, and attended Cornell University. He entered railway service in February, 1907, as an inspector on the New York tunnels of the Pennsylvania and the following year he became connected with the Brooklyn Rapid Transit Company. On April 1, 1909, he entered the service of the engineering department of the Northern Pacific as an inspector and later was promoted successively to bridge supervisor and roadmaster. In 1915, he was advanced to trainmaster at Forsyth, Mont., and two years later he was further promoted to division superintendent at Pasco, Wash. Shortly thereafter, Mr. Sloan entered the service of the United States Army and served overseas as a captain. He returned to the Northern Pacific in 1919 as superintendent of the Rocky Mountain division, and was later transferred successively to the Pasco, Yellowstone and Lake Superior divisions. In July, 1927, he was appointed assistant to the operating vice-president and on July 15, 1929, he was advanced to general manager of the lines east of Paradise, Mont. Mr. Sloan was appointed general manager of the system, with headquarters at St. Paul, Minn., and Seattle, Wash., in August, 1931.

W. C. Sloan

Engineering

H. T. Morrison, locating engineer, of the Canadian National, with headquarters at Toronto, Ont., has been retired on pension, effective January 26.

William M. Jaekle has been appointed assistant division engineer on the Salt Lake division of the Southern Pacific, with headquarters at Ogden, Utah, succeeding **H. A. Lathrop,** who has been transferred to the Coast division, with headquarters at San Francisco, Cal. Mr. Lathrop succeeds **W. W. Winn,** who retired on January 1.

F. C. Kronauer, division engineer on the Erie, with headquarters at Jersey City, N. J., has been appointed to the newly created position of chief engineer of the New York, Susquehanna & Western, with headquarters at Paterson, N. J. For many years the N. Y. S. & W. operated as part of the Erie, but effective March 1, it will become an independent line.

J. J. Clutz, supervisor of track on the New York division of the Pennsylvania, with headquarters at Trenton, N.J., has been promoted to division engineer of the Indianapolis division, with headquarters at Indianapolis, Ind., to succeed **E. O. Wood,** who has been appointed chief clerk to the chief engineer maintenance of way of the Western region at Chicago.

Charles O. Coverly, whose appointment as architect for the Atchison, Topeka & Santa Fe, with headquarters at Chicago, was announced in the February issue, was born in Kansas City, Mo., on February 24, 1902, and attended Missouri University and Armour Institute, Chicago. After employment with various architects in Kansas City, he entered railway service on the Santa Fe in March, 1925, later becoming architectural draftsman at Chicago, the position he held at the time of his promotion.

Henry K. Hislop, an assistant track supervisor on the New York, New Haven & Hartford, whose promotion to assistant division engineer, with headquarters at Providence, R.I., was announced in the January issue, was born on May 16, 1901, at New Haven, Conn. Mr. Hislop was graduated in civil engineering from Yale University in 1923, and entered railway service with the New Haven in June, 1923, serving in the drafting room at New Haven until September, 1935, when he was appointed assistant engineer, with the same headquarters. In August, 1936, Mr. Hislop was appointed assistant track supervisor at Providence, being transferred to New London, Conn., in February, 1938. He was located at the latter point at the time of his recent promotion to assistant division engineer.

Karl Huffman, whose appointment as engineer of construction of the Central region of the Canadian National with headquarters at Toronto, Ont., was announced in the February issue, was born on May 12, 1889, at Toronto. He started his railway career in Toronto on February 1, 1910, as a draftsman in the engineering department of the Canadian National, being appointed assistant engineer in the right of way department on January 2, 1912. On June 1, 1915, he returned to the engineering department as a draftsman, becoming an assistant engineer on July 1, 1916. In June, 1921, Mr. Huffman was transferred to Capreol, Ont., being promoted to acting division engineer on July 16, 1923. On August 1, 1924, he returned to Toronto as an assistant engineer in the engineering department, which position he held until his recent appointment.

Gurney Henrickson Dayett, bridge designing engineer on the Baltimore & Ohio, has been promoted to assistant engineer of bridges, with headquarters at Baltimore, Md., succeeding **Charles E. Sloan,** whose promotion to engineer of bridges was announced in the February issue. Mr. Dayett was born at Wilmington, Del., on February 20, 1887, and attended the public schools of Wilmington. He was graduated in civil engineering from Lehigh University in June, 1909. Following his graduation, Mr. Dayett entered the service of The American Bridge Company as a draftsman in its plant at Edge Moor, Del., and remained with that company until February 16, 1922, when he entered the service of the Baltimore & Ohio as a bridge draftsman, at Baltimore. In January, 1927, he became an assistant engineer, in November, 1929, chief draftsman, and in March, 1934, bridge designing engineer.

Gurney Henrickson Dayett

Ernest R. Logie, division engineer on the Canadian National, with headquarters at Belleville, Ont., has been promoted to district engineer of the Southern Ontario district, with headquarters at Toronto, Ont., succeeding **J. R. Mackenzie,** promoted. **H. E. Smith,** division engineer of the Capreol division, with headquarters at Capreol, Ont., has been transferred to the Belleville division, with headquarters at Belleville, Ont., relieving Mr. Logie, and **W. E. Mellor** has been appointed division engineer of the Capreol division, replacing Mr. Smith.

Mr. Logie was born on August 16, 1886, at Chatham, N.B. He entered the service of the Canadian National on January 1, 1919, as a resident engineer at Toronto,

Ernest R. Logie

and on February 24, 1920, was appointed division engineer of the Superior division. He returned to Toronto on November 5, 1920, as office engineer, and on June 1, 1921, was promoted to assistant engineer. On March 1, 1928, he was appointed division engineer, with headquarters at Belleville, which position he held until his recent appointment.

R. E. Couglan, supervisor of water supply of the Chicago & North Western, with headquarters at Chicago, has been appointed engineer of tests, with the same headquarters, and will continue also in charge of water supply. Mr. Couglan was born in Madison, Wis., on October 22, 1891, and graduated from Northwestern University in 1911. He entered railway service after graduation in the chemical laboratory of the North Western, and early in 1912, he was promoted to fuel oil inspector at Casper, Wyo. In May, 1915, he was transferred to the Pittsburgh district as a material inspector and during the World War he was slated for water supply work with the 13th engineers, but because of too extreme difficulty with locomotive operation, due to water conditions, was withheld from service at the request of the superintendent of motive power. In 1922, he was appointed supervisor of water supply, with headquarters at Chicago, which position he held until February 15.

R. E. Couglan

A. H. Stimson, supervisor of track on the Pittsburgh division of the Pennsylvania, who has been promoted to division engineer of the Monongahela division, with headquarters at Pittsburgh, Pa., as reported in the February issue, was born on January 11, 1907, at Cincinnati, Ohio. Mr. Stimson received his higher education at Virginia Military Institute, graduating in civil engineering in 1927. He entered the service of the Pennsylvania on July 1, 1927, as an assistant on the engineer corps of the Maryland division, being transferred to the New York division in the following year. In July of the same year, he was advanced to assistant supervisor of track on the Williamsport division, later serving in this capacity on the Middle, Philadelphia, Philadelphia Terminal and Maryland divisions. On February 1, 1934, Mr. Stimson was further promoted to supervisor of track on the Cincinnati division, later being transferred to the Pittsburgh division. His promotion to division engineer of the Monongahela division became effective on January 16.

E. M. M. Hill, engineer of construction and right of way agent of the Western region of the Canadian National, has been promoted to chief engineer of that region, with headquarters as before at Winnipeg, Man., succeeding **H. A. Dixon,** whose promotion, effective January 1, to chief engineer of operation for the system, with headquarters at Montreal, Que., was announced in the December issue. Mr. Hill was born at Guelph, Ont., in 1882, and entered railway service in 1903 as a rodman on the Canadian Northern (now part of the Canadian National). He served in various engineering positions, principally on location and construction work, until the World War when he served for two years with the Royal Engineers. Upon his return, he re-entered railway service in the engineering department on the Western lines of the Canadian National. In the spring of 1931, Mr. Hill was appointed reconnaissance engineer of the Western region, with headquarters at Winnipeg, and in May, 1932, he was appointed engineer of construction of the Western region. His title was later changed to engineer of construction and right of way, the position he held until his recent promotion.

E. M. M. Hill

L. H. Jentoft, assistant division engineer on the Erie at Hornell, N. Y., has been promoted to division engineer, with headquarters at Dunmore, Pa., replacing **Paul Sobbott,** who has been transferred to Jersey City, N. J., relieving **F. C. Kronauer,** whose appointment as chief engineer of the New York, Susquehanna & Western is announced elsewhere in these columns. **Raymond J. Pierce,** supervisor of track of Subdivision No. 1 of the New York, Susquehanna & Western, with headquarters at Paterson, N. J., has been appointed assistant division engineer on the Erie, with headquarters at Hornell, succeeding Mr. Jentoft.

Mr. Pierce was born on February 21, 1906, at Salamanca, N. Y., and attended the University of Rochester and the University of Michigan. He entered railway service with the Erie in June, 1927, as a concrete inspector at Corning, N. Y., and six months later he became a rodman at Hornell, N. Y., serving alternately in this position and as a levelman at Hornell until March 31, 1929. At that time he was advanced to transitman at the same point, later being transferred to Susquehanna, Pa. On October 16, 1931, Mr. Pierce was appointed engineering accountant, with the same headquarters, being transferred to Dunmore, Pa., on March 16, 1932. On April 1, 1934, he was appointed chief of the engineering corps at Dunmore, which position he held until January 1, 1935, when he was appointed general yard foreman (track) at Buffalo, N. Y.

George F. Blackie, whose retirement on January 1, as chief engineer of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., was announced in the February issue, was born at Nashville, Tenn., on December 22, 1869, and was educated at Montgomery Bell Academy, Nashville, and at Vanderbilt University. He entered railway service on the N. C. & St. L. on November 24, 1886, and served as a rodman and chainman until 1888, when he left to enter Vanderbilt University. A year later, he returned to the service of this road as a maintenance of way clerk and draftsman in the chief engineer's office. In December, 1892, he was promoted to assistant engineer, which position he held until July, 1899, when he left railway service to become superintendent of the American Phosphate Company and served in this position and as engineer of the Mt. Pleasant Southern, Mt. Pleasant, Tenn. (charter surrendered in 1934), until February, 1901. On that date he returned to the N. C. & St. L. as an assistant engineer, being promoted to engineer of roadway and track in 1914. Mr. Blackie was promoted to assistant chief engineer in December, 1916, and on November 1, 1931, he was advanced to chief engineer, the position he held until his retirement.

George F. Blackie

W. Paul Sullivan, whose appointment as assistant to the chief engineer of the Chicago, Indianapolis & Louisville (Monon), with headquarters at LaFayette, Ind., was announced in the February issue, was born at Romney, Ind., on June 14, 1896, and attended LaFayette Business College. He entered railway service on April 4, 1912, serving that summer as a section laborer on the Monon. He returned to the Monon on July 1, 1914, and

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served successively as a stenographer in the freight traffic department at LaFayette and secretary to the superintendent of bridges and buildings and the superintendent of telegraph and signals. He left railway service to go with the Willys Overland Company at Toledo, Ohio, on June 15, 1917, and shortly thereafter joined the U. S. Army. He returned to railroad service on September 15, 1919, as chief clerk to the superintendent of roadway and structures of the Monon at LaFayette, and several months later was appointed chief clerk to the engineer maintenance of way. Mr. Sullivan was appointed chief clerk to the chief engineer on February 1, 1938, and held that position until his recent promotion.

Track

J. J. Desmond, assistant engineer on the Illinois Central at Water Valley, Miss., has been promoted to track supervisor at Freeport, Ill., succeeding **E. J. Boland,** who retired on March 1.

Lucien Desharnais, section foreman on the Canadian Pacific at Brooks, Alta., has been promoted to roadmaster, with headquarters at Coronation, Alta, succeeding **R. D. Currie,** who has been transferred to Lloydminster, Sask. Mr. Currie relieved **M. Bourne,** who has retired because of ill health.

K. J. Silvey, supervisor of track in the general office of the Pennsylvania at Philadelphia, Pa., effective February 15, has been transferred to the New York division at Trenton, N. J., to succeed **J. J. Clutz,** whose appointment as division engineer is noted elsewhere in these columns.

John Shurtleff, track supervisor on the Chicago, Rock Island & Pacific at Herington, Kan., has been promoted to roadmaster, with headquarters at El Reno, Okla., succeeding **C. H. Hardwick,** whose promotion to district maintenance engineer, with headquarters at El Reno, was announced in the February issue.

J. O. Levesque has been appointed roadmaster on the Canadian National, with headquarters at Lindsay, Ont., succeeding **J. Fraser,** who has been transferred to St. Thomas, Ont. Mr. Fraser succeeds **H. E. Clare,** who remains at St. Thomas as roadmaster, replacing **W. E. Mellor,** who has been transferred.

L. A. Evans, supervisor of track on the Philadelphia division of the Pennsylvania, with headquarters at Harrisburg, Pa., has been transferred to the Pittsburgh division. As announced in the February issue, **J. P. Hiltz, Jr.,** has been appointed supervisor of track on the Philadelphia division to succeed Mr. Evans.

J. R. Van Lenten, assistant division engineer on the Erie at Jersey City, N. J., has been appointed track supervisor on the New York, Susquehanna & Western at Paterson, N. J., succeeding **Raymond J. Pierce,** whose appointment as assistant division engineer on the Erie at Hornell, N. Y., is announced elsewhere in these columns.

G. B. Aydelott, who has been on a leave of absence to serve as government inspector in charge of the rail change occasioned by the Deer Creek Reclamation project in Utah, has returned to the Denver & Rio Grande Western as assistant roadmaster at Grand Junction, Colo. **H. P. Lessler,** office engineer at Pueblo, Colo., has been appointed assistant roadmaster at Grand Junction, Colo.

A. M. Olson, section foreman and extra gang foreman on the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont., has been promoted to roadmaster at Mobridge, S. D., succeeding **E. W. Knesal,** who has been transferred to Miles City, Mont. Mr. Knesal relieves **Jack Fuller,** who has been transferred to St. Maries, Idaho. Mr. Fuller replaces **R. W. Gallagher,** whose death on February 2 is announced elsewhere in these columns.

William F. March, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Washington, Iowa, was announced in the February issue, was born at Davenport, Wash., on February 8, 1889, and entered railway service on January 5, 1905, on the Atchison, Topeka & Santa Fe. On January 1, 1911, he went with the Rock Island as a section foreman and on October 1, 1931, he was promoted to track supervisor. In October, 1939, he was advanced to assistant roadmaster, with headquarters at Rock Island, Ill., the position held until his promotion on January 1.

Patrick H. Fitzsimmons, whose retirement on February 1, as track supervisor on the Louisville & Nashville, with headquarters at Humboldt, Tenn., was announced in the February issue, was born at LaGrange, Tenn., on February 2, 1875, and entered railway service on November 1, 1889, as a section laborer on the L. & N. at Faxon, Tenn. He was promoted to apprentice foreman on June 1, 1891, and on November 1, 1899, he was advanced to section foreman at Corbandale, Tenn., later serving in this capacity and as extra gang foreman at various points in Tennessee and Kentucky. On December 1, 1920, he was promoted to track supervisor at Clarksville, Tenn., being transferred to Paris, Tenn., on September 1, 1929, and to Humboldt in May, 1932.

N. B. Tyler, whose promotion to track supervisor on the Louisville & Nashville, with headquarters at Lagrange, Ky., was announced in the February issue, was born at Shepherdsville, Ky., on March 10, 1906, and entered railway service in May, 1923, as a rodman on construction work on the L. & N. The following year he was appointed masonry inspector and in August, 1926, he was promoted to instrumentman. In January, 1934, he went with the E. I. DuPont DeNemours Company as a labor foreman and later served as a masonry inspector for the Kentucky Department of Highways and as a bridge engineer for the Indiana Highway Commission. Mr. Tyler returned to the L. & N. in June, 1938, as an instrumentman on the Cincinnati division, with headquarters at Latonia, Ky., the position he held until his recent promotion.

Nevin M. Tullis, whose promotion to supervisor of track on the Elkins division of the Western Maryland, with headquarters at Elkins, W. Va., was announced in the December issue, was born on January 24, 1908, at Hagerstown, Md. He first entered railway service on January 17, 1927, as a chainman in the engineering department on the Hagerstown division, where he remained until October 1, 1927, when he was advanced to a rodman. He held this position until October 1, 1934, when he became an instrumentman. From October 1, 1935, to April 1, 1939, he served as supervisor of track with headquarters at Hanover, Pa., then being appointed assistant supervisor of track, with the same headquarters. His reappointment as supervisor of track at Elkins took place on November 1.

H. G. Russell, assistant engineer on the St. Louis Southwestern (of Texas) has been promoted to roadmaster at Waco, Tex., succeeding **W. Francis,** who has been transferred to Dallas, Tex. Mr. Francis replaced **J. F. Montgomery,** whose promotion to bridge and building supervisor, with headquarters at Tyler, Tex., was announced in the January issue.

Mr. Russell was born at Jefferson City, Mo., on October 28, 1894, and entered railway service in September, 1913, as a rodman on the Louisiana & Arkansas. In February, 1918, he was promoted to assistant engineer and in March, 1920, he went with the Missouri-Kansas-Texas as a transitman, six months later becoming a transitman for the St. L. S. W. in Texas. In January, 1923, he was advanced to assistant engineer, and five years later he was promoted to roadmaster, with headquarters at Waco, Tex. Mr. Russell was re-appointed assistant engineer in January, 1933, the position he held until his recent promotion.

John Hubert Burns, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at St. Joseph, Mo., was announced in the January issue, was born at Evansville, Mo., on December 26, 1906, and entered railway service on May 1, 1927, on the Missouri Pacific. On August 14, 1936, he went with the Chicago, Rock Island & Pacific as an assistant extra gang foreman and on June 1, 1937, he was promoted to foreman of a system rail-laying extra gang. On September 15, 1937, he was appointed track supervisor at Dalhart, Tex., and on April 1, 1938, he was promoted to assistant roadmaster in charge of a system rail-laying gang, returning to his position as track supervisor on August 15, 1938. In September, 1938, he was transferred to Trenton, Mo., and from March 1, 1939, to December 15, 1939, he again served as assistant roadmaster in charge of a system rail-laying gang, the position he held at the time of his recent promotion which was effective December 15.

F. B. Noonan, whose promotion to track supervisor on the Illinois Central, with headquarters at Olney, Ill., was announced in the February issue, was born at Indianapolis, Ind., on September 27, 1908, and graduated from Purdue University in 1931. He entered railway service during the summers of 1926 and 1927,

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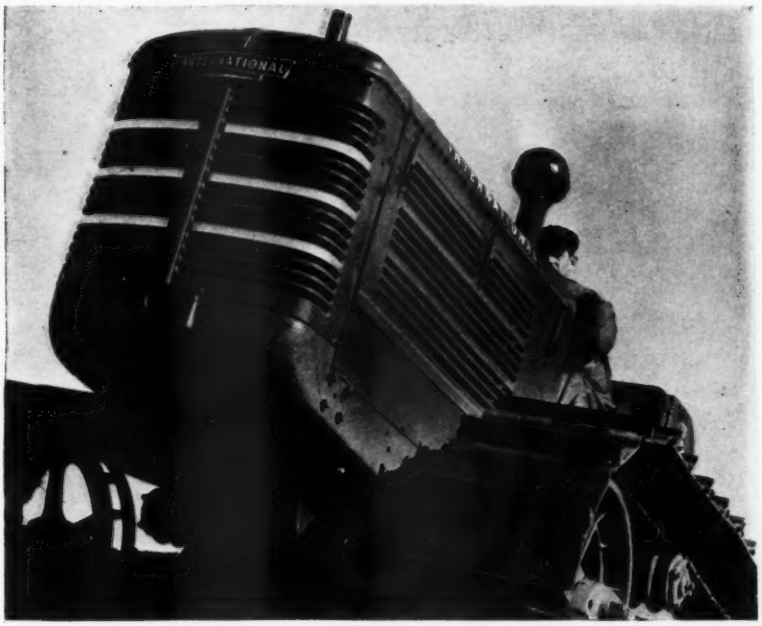

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as a chainman on construction work in the Chicago terminal of the Illinois Central and continued as a chainman on the Chicago Terminal division from September 1, 1927, to September 1, 1928. During the summers of 1929 and 1930, he served as a rodman on the Chicago Terminal and the Illinois divisions. Following graduation he went with the Indianapolis Union Railway, Indianapolis, Ind., and later worked for coal companies in Illinois and Indiana. On January 1, 1934, he returned to the Illinois Central as a chainman on construction in connection with the building of the Bonnet Carre Spillway bridges and on August 1, 1935, he was transferred to the Vicksburg division. On May 1, 1936, he was promoted to rodman and on February 1, 1939, he was advanced to instrumentman, the position he held at the time of his recent promotion.

Edward F. Sullivan, whose retirement as roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Washington, Iowa, was announced in the February issue, was born at Hoopeston, Ill., on February 10, 1874, and entered railway service on March 28, 1889, as a section laborer on the Chicago & Alton (now the Alton). In August, 1892, he was promoted to section foreman and on February 19, 1897, he went with the Kansas City Southern. Mr. Sullivan was advanced to roadmaster in July, 1900. From January, 1901, to December, 1901, he served on construction and as a roadmaster on the Shreveport & Red River Valley (now part of the Louisiana & Arkansas), later going with the Texas & Pacific on construction work in Louisiana. In March, 1904, he returned to the Kansas City Southern for four years, then served three years with a lumber company, and in March, 1911, he went with the St. Louis-San Francisco as an extra gang foreman, being promoted to roadmaster on April 1, 1912. In October, 1913, Mr. Sullivan entered the service of the Rock Island as a roadmaster, with headquarters at Washington, Iowa, where he remained until his retirement on January 1.

Henry Charles Koch, whose promotion to roadmaster of the Belt Railway of Chicago, with headquarters at Clearing Yard, Ill., was announced in the January issue, was born at Columbus, Ohio, on February 21, 1897, and attended Lane Technical School, Chicago. He entered railway service in May, 1913, as a clerk in the operating department of the Belt Railway, and in October, 1915, he was transferred to the traffic department, several months later being transferred again to the maintenance of way department. In July, 1917, he became a private in the 33rd division of the United States Army and was later promoted successively to sergeant and battalion sergeant major. In June, 1919, he returned to the Belt Railway as chief clerk in the maintenance of way department, and in November, 1927, he was promoted to roadmaster. Mr. Koch was appointed assistant roadmaster in December, 1930, and a year later he was advanced to master carpenter. In June, 1932, he was appointed a carpenter foreman and in July, 1937, he was appointed track supervisor, with headquarters as before at Clearing Yard, the position he held until his promotion on January 1.

Sydney M. Rodgers, assistant supervisor of track on the New York division of the Pennsylvania, whose promotion to supervisor of track on the Wilkes-Barre division, with headquarters at Reading, Pa., was announced in the January issue, was born on October 3, 1911, at Buffalo, N. Y. He was graduated from Princeton University in 1932, and attended the Yale University Graduate school in 1933. During summer vacations while attending college, Mr. Rodgers served in various capacities on the Pennsylvania, including that of laborer at the enginehouse at Ebenezer, N. Y., in 1928, chainman at East Aurora, N. Y., in 1929, transportation inspector at Buffalo in 1930, and maintenance of way inspector at the same point in 1931. On November 15, 1933, he returned to the service of this company as an inspector on improvement work at Baltimore, Md., being appointed an assistant on the engineering corps at Cleveland, Ohio, in March, 1934. In June of the same year, he was promoted to assistant supervisor of track (branch line) at Buffalo, being transferred to the main line at Downingtown, Pa., in December, 1935. In June, 1939, Mr. Rodgers was further transferred to New Brunswick, N. J., where he was located at the time of his recent promotion to supervisor of track on the New York division.

Bridge and Building

H. W. Froats has been appointed bridge and building master of the Belleville division of the Canadian National, with headquarters at Belleville, Ont., succeeding **W. J. Tyers,** who has retired.

W. Locke has been appointed master of bridges and buildings on the joint track of the Canadian National and the Wabash, with headquarters at St. Thomas, Ont., succeeding **A. V. Johnston,** who has been transferred.

R. H. Beeder, acting general foreman of bridges and buildings of the Slaton division of the Panhandle & Santa Fe, with headquarters at Slaton, Tex., has been promoted to general water service foreman of the Western lines of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex. **A. W. Gobeli** has been appointed acting general foreman of bridges and buildings at Slaton, succeeding Mr. Beeder.

Henry A. Horning, whose retirement as superintendent of buildings of the Michigan Central, with headquarters at Jackson, Mich., was announced in the January issue, was born in Norvell, Mich., on December 7, 1869, and entered railway service in the building department of the Michigan Central at Jackson on April 4, 1892. In June, 1896, he was promoted to division foreman of buildings at Niles, Mich., and on June 1, 1907, he was advanced to assistant superintendent of buildings, with headquarters at Jackson. Mr. Horning was further promoted to superintendent of buildings on May 1, 1909, and continued in that capacity until his retirement on January 1.

William R. Burke, whose promotion to supervisor of bridges and buildings on the Illinois Central, with headquarters at Champaign, Ill., was announced in the February issue, was born at Harvard, Neb., on November 17, 1888, and entered railway service on July 2, 1907, as a painter on the Chicago Terminal and the Illinois divisions. On August 1, 1911, he was promoted to assistant foreman and during the World War he served in the U. S. Army with Battery D, 68th Artillery. On April 1, 1919, he returned to the Illinois Central as a bridge and building foreman on the Illinois division and on July 1, 1938, he was promoted to general foreman of bridges and buildings on that division, with headquarters at Champaign, Ill., the position he held until his promotion on January 1.

John Harlan Morgan, whose retirement on January 1 as supervisor of bridges and buildings on the Illinois Central at Champaign, Ill., was announced in the February issue, was born at Hopkinsville, Ky., on June 29, 1872, and entered railway service in September, 1891, on the Kentucky division of the Illinois Central as a carpenter. In 1897, he was promoted to foreman and in November, 1906, he was advanced to supervisor of bridges and buildings on the Nashville division. In May, 1908, after the Nashville division was abolished, Mr. Morgan was appointed a bridge and building foreman on the Kentucky division. He was advanced to general foreman on the St. Louis Terminal division in January, 1925, and in September, 1929, he was promoted to supervisor of bridges and buildings, with headquarters at Champaign, the position he held until his retirement on January 1.

Obituary

R. W. Gallagher, roadmaster on the Chicago, Milwaukee, St. Paul & Pacific at St. Maries, Idaho, was killed in an accident on February 2.

Charles H. Neal, who retired in the spring of 1936 as a roadmaster on the Southern Pacific, with headquarters at Redding, Cal., died on January 12.

Joseph A. Ottman, who retired in May, 1924, as general roadmaster of the Wyoming division of the Union Pacific, with headquarters at Cheyenne, Wyo., died at the age of 87 in Denver, Colo., on February 16.

A. P. Briggs, locating engineer of the Chicago, Rock Island & Pacific, died suddenly of coronary thrombosis on January 29, while on a survey between Princeton, Mo. and Mercer. Mr. Briggs had previously been locating engineer for the Denver & Rio Grande Western at Denver, Colo., and locating engineer of the Fort Worth & Denver City at Ft. Worth, Tex.

Clarence McCullough, roadmaster on the Chicago, Indianapolis & Louisville (Monon), with headquarters at Lafayette, Ind., died on February 7. Mr. McCullough was born at Quincy, Ind., on September 27, 1879, and entered the service of the Monon on July 3, 1900, as a track laborer, later being promoted to timekeeper. In 1906, he was appointed an assistant extra gang foreman and in 1908 he was advanced to extra

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gang foreman. On October 28, 1912, he became a brakeman and on September 30, 1915, he was appointed roadmaster at Bloomington, Ind., later being transferred to Monon, Ind. He became a brakeman again on October 1, 1917, and on May 1, 1920, he was appointed roadmaster of the Northern division, with headquarters at Monon. In 1930, his headquarters were changed to Lafayette, Ind.

A. F. Blaess, who retired on May 1, 1938, as chief engineer of the Illinois Central, with headquarters at Chicago, died on February 19, at Gulfport, Miss., following a stroke suffered three days previously. Mr. Blaess was born at Ann Arbor, Mich., on January 6, 1871, and graduated in civil

A. F. Blaess

engineering from the University of Michigan in 1895. His first railway service was with the Detroit & Mackinac, which company he left in June, 1897, to go with the Illinois Central as a track apprentice. After several months in this capacity he was made a rodman, later serving as a transitman. In 1900, he was made a resident engineer and after a year in this capacity he was promoted to assistant engineer. From 1902 to 1905, Mr. Blaess served as a track supervisor, and in the latter year he was further promoted to roadmaster. After five years in this capacity, he was made assistant engineer maintenance of way, and in 1913 he was appointed district engineer. In the following year he was promoted to engineer maintenance of way and held this position for 11 years. He served as chief engineer from 1925 until he retired in 1938. During his service as chief engineer, Mr. Blaess had supervision over a number of major engineering projects, including the construction of the 169-mile Edgewood cutoff in Illinois, the building of the Bonne Carre Spillway bridges of the Illinois Central and the Yazoo & Mississippi Valley, the reconstruction of the south approach to the Ohio River bridge at Cairo, Ill., the construction of the company's extensive locomotive repair facilities at Paducah, Ky., and the prosecution of an extensive track elevation project at Jackson, Miss. For many years, he was active in the affairs of the American Railway Engineering Association, serving as a director from 1924 to 1926, and treasurer from March, 1930 to March, 1938. He was vice-chairman of the Committee on Rail from March, 1929 to March, 1938.

Association News

Bridge and Building Association

The proceedings of the convention of last October are now in the hands of the printer and will be distributed to the members during March. Members of the association who will be in Chicago during the A.R.E.A. convention will gather at their annual luncheon Tuesday, March 12.

Roadmasters Association

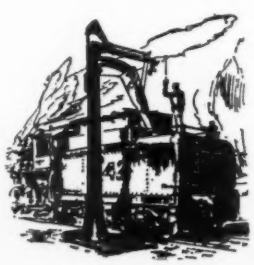
Members of the Executive Committee will meet in Chicago at 10 o'clock on Monday, March 11, to review the work of the association, adjourning at noon to enable the members to visit the N.R.A.A. exhibit that afternoon. The proceedings of last September's convention are now in the bindery and will be available for distribution to members after March 1.

Metropolitan Maintenance of Way Club

The February meeting of the club, which was held at the Governor Clinton hotel, New York, on February 20, was devoted entirely to a discussion of the report that the club is preparing in collaboration with a committee of the Roadmasters and Maintenance of Way Association. The assignment of this committee is to report on the Effect of Weight of Rail on Track Maintenance. Prior to the meeting of the club, the subject had been broken down into nine subdivisions and committees had been appointed to render reports on each of these subdivisions. At the meeting the reports of a number of the committees were presented, and in each case they were subjected to general discussion from the floor.

Maintenance of Way Club of Chicago

B. R. Kulp, engineer of maintenance of the Chicago and North Western, spoke on High-Speed Turnouts at a meeting of the club on February 26, at which 119 members and guests were in attendance. Commenting in detail upon the latest developments in turnout design and construction, and the importance of a high standard of maintenance to meet the exacting requirements of high-speed operation, the speaker provoked a long and interested discussion which was participated in by a large number of maintenance of way officers and representatives of the manufacturers of special trackwork.



The next regular meeting will be held at the Auditorium Hotel on March 25, when R. S. Belcher, manager of treating plants, Atchison, Topeka & Santa Fe System, will speak on "The Trackman's Responsibility for Getting the Most Out of Crossties."

Supply Trade News

General

The D. J. Murray Manufacturing Company, Wausau, Wis., has dissolved the **Unit Heater & Cooler Co.,** which it established in 1929 as the sales organization for its "Grid" unit heater and cooler, and has taken over its manufacture and sales.

Personal

M. H. Kuhl, district manager of industrial sales for the **Timken Roller Bearing Company,** Canton, Ohio, has been appointed assistant manager of industrial sales, succeeding **S. D. Partridge,** whose appointment as manager of industrial sales was announced in the February issue.

D. H. McAdams, district manager of automotive compressor sales of the Ingersol-Rand Company, with headquarters at Chicago, has resigned to become midwestern division manager of the **Joyce-Cridland Company,** Dayton, Ohio, with headquarters in Chicago.

Charles E. Wilson, vice-president in charge of the Pacific Coast operations of the **Worthington Pump & Machinery Corporation** since 1934, has moved his headquarters to the home office at Harrison, N. J., where he will direct the sales of all products handled by the corporation's Carbondale division, which specializes in air conditioning and refrigeration equipment. In this work he succeeds **H. A. Feldbush,** who will devote his time to the manufacturing department. Mr. Wilson is also assuming directional charge of the sales of all products built at the Holyoke, Mass., factory.

F. M. Huffman, assistant manager of sales at Baltimore, Md., of the **Bethlehem Steel Company,** has been appointed assistant general traffic manager, with headquarters at Bethlehem, Pa. Mr. Huffman attended Lehigh University following his service in the World War and entered the employ of the Bethlehem Steel Company upon his graduation in 1922. The following year he was assigned to the Philadelphia, Pa., sales office and he was later transferred to Chicago. He was appointed manager of sales at St. Louis, Mo., in 1936, and in March, 1938, became assistant manager of sales at Baltimore.

Obituary

John J. Fasmer, general sales manager of the **Stephens-Adamson Manufacturing Company,** Aurora, Ill., died suddenly at that point on February 3. Mr. Fasmer, who had been with this company since its organization in 1901, had been general sales manager at Aurora since 1931.

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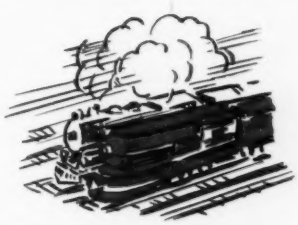

SEE IT at the RAILWAY SHOW

If your old Adzing Machine has reached the age where an extensive overhaul is necessary, it will pay to investigate the improvements to be had in this new model. See it at the Railway Appliance Show in Chicago. Examine the conveniences and facilities this machine now has for doing an improved and more accurate job of tie adzing.

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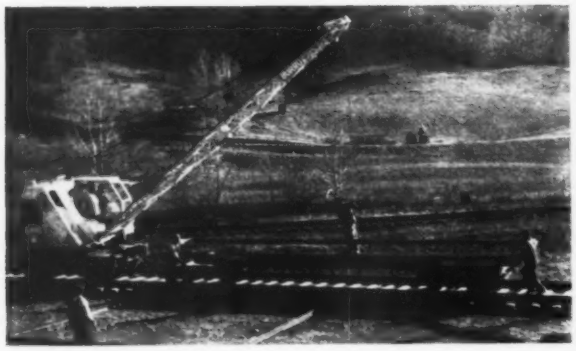
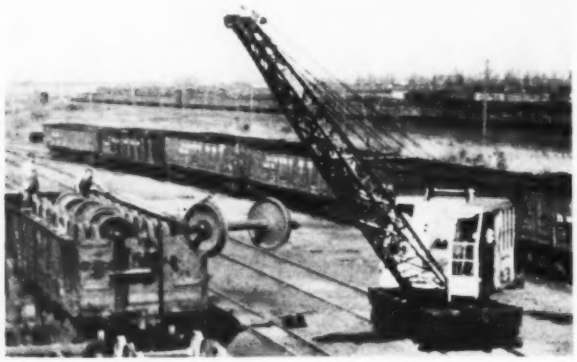
BURRO SPEED



ON THE LINE . fast travel speed, over 20 miles an hour, gets the Burro to and from work very quickly—it can haul men and materials to and from camp cars. This speed is very important in clearing for trains when working under traffic. More real crane service is obtained through less time spent in traveling.



IN THE YARD . or terminal much valuable time is saved in traveling from job to job through fast travel speed—no need to employ a switch engine to make a quick move. This means more crane work done, and done more economically. Another big advantage is the Burro's ability to haul and switch cars.

BURRO CRANES

Model 15.....Model 30

BURRO ANTI-SLIP RAIL TONGS

Write for Bulletin

CULLEN-FRIESTEDT COMPANY
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QUALITY MARK ON WRENCHES

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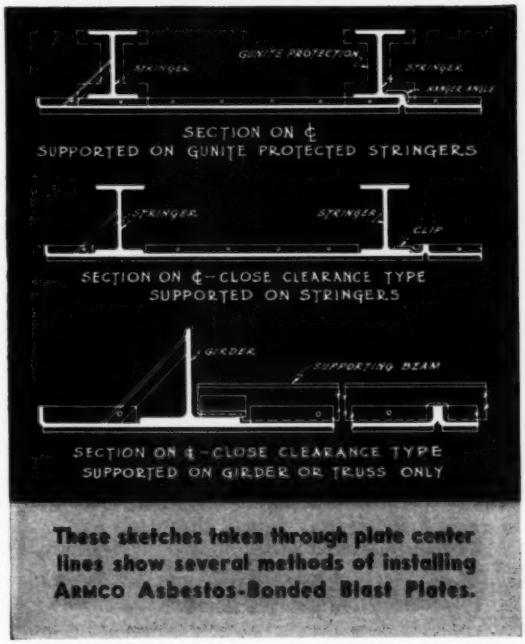
"Superior" Wrenches are approximately *twice as strong* as old-fashioned wrenches of this type . . . practically as strong as alloy wrenches costing nearly twice as much . . . yet they cost no more than ordinary wrenches.

Investigate Williams' before you buy *any* wrenches. Williams' line offers a type and size for practically every railroad requirement. All are fully guaranteed and sold by industrial distributors everywhere.

J. H. WILLIAMS & CO., 225 Lafayette St., NEW YORK

PROTECTION DOLLARS
Go Farther With Armco Blast Plates!



These sketches taken through plate center lines show several methods of installing ARMCO Asbestos-Bonded Blast Plates.

Here's good news for Bridge and Building men! You can save money and gain greater protection for overhead structures by using ARMCO Asbestos-Bonded Blast Plates.

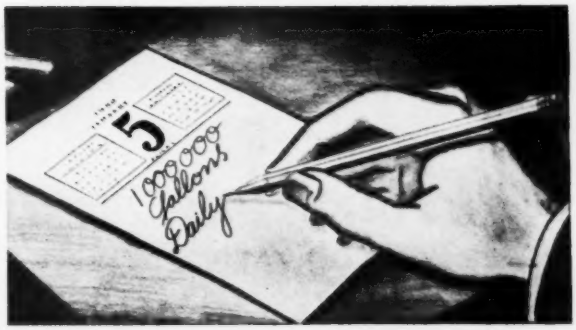
These durable plates offer you this triple-assurance of long, protective service: (1) A substantial base plate of ARMCO Ingot Iron—proved by 34 years in corrosive service; (2) a uniform galvanized coating; (3) a special protective material tightly bonded to the galvanized metal by ARMCO's exclusive Asbestos-Bonding process. All bolts and hangers are shielded against cinders and blast fumes.

You'll find too that installation costs are lower. Excess weight has been eliminated, making ARMCO Plates easier to handle than heavy, bulky types. Fewer hangers are needed and the work goes faster. Also important, ARMCO Plates do not need stiffening angles because of their flanged design.

Use ARMCO Asbestos-Bonded Blast Plates for low-cost protection on any type of overhead structure. Let us tell you more about their many advantages for your next job. Armco Drainage Products Association, 5030 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO
ASBESTOS-BONDED
BLAST PLATES



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"Protection Against Substitution"

"Bill, why didn't we get that order on the A. railroad?" asked the sales manager of his star railway salesman.

"Boss, I thought I had it but the P. A. (purchasing agent) switched it to the X Company."

"After you got our material specified?"

"That's correct. The chief engineer told the P. A. that it didn't make any difference to him if they could save any money."

"That's tough luck."

"Luck, h——. It's just plain dumb on our part."

"What do you mean?"

"Just this—We got to sell these people so solidly that no one will be able to change them. And you've got to help me."

"In what way?"

"Through advertising in *Railway Engineering and Maintenance.* There's nothing like that magazine for keeping our product before these maintenance officers month after month until they come to know our material so well that they insist on it. And they're the final word when they insist."

"You mean then that advertising provides protection against substitution?"

"That's it. It's the best protection one can get."

"I see your point. We'll start at once. We want our sales to stay sold."

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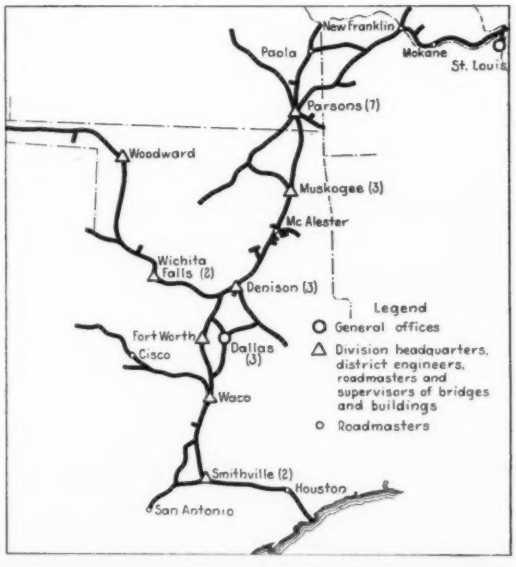
Railway Engineering and Maintenance goes every month to 31 supervisory maintenance officers of the Missouri-Kansas-Texas Lines at **two general, six division and nine other supervisory headquarters** scattered all the way from St. Louis, Mo., to Woodward, Okla., and San Antonio and Houston, Tex. This magazine also goes to 22 other subordinate officers who are in training for promotion to supervisory positions on this railway.

★



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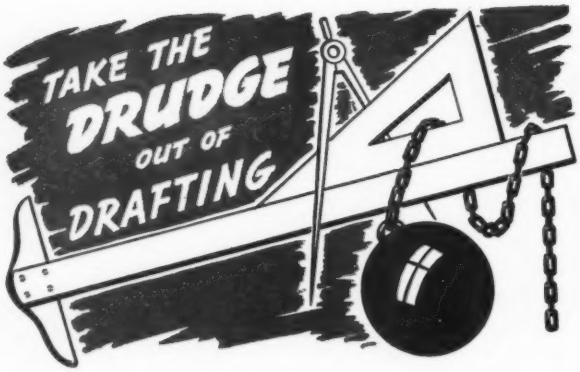

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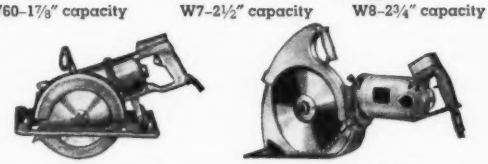

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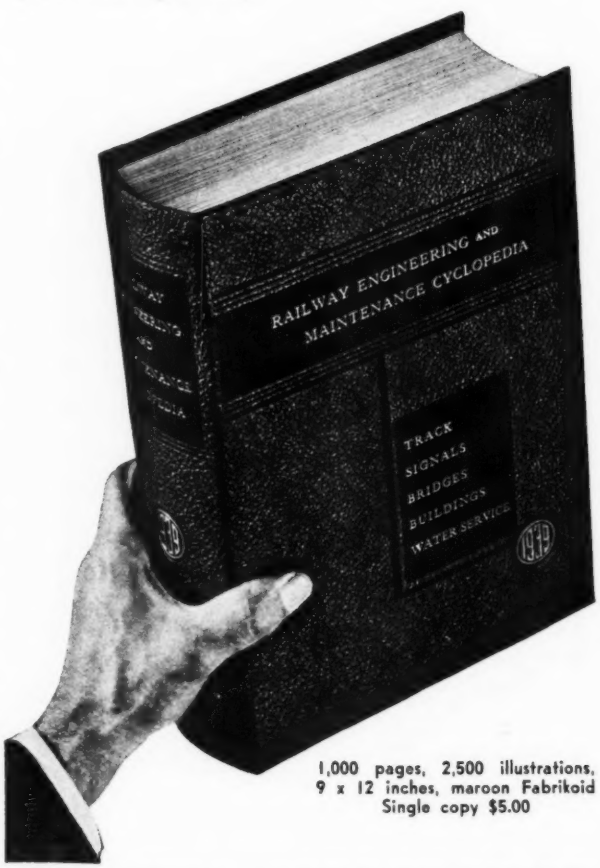

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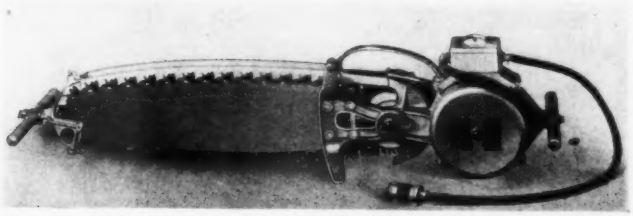

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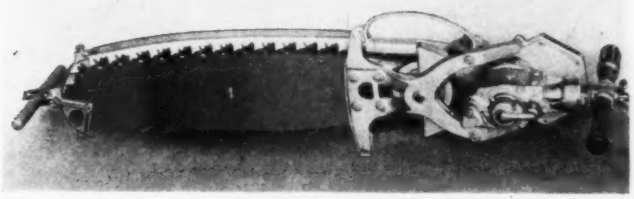

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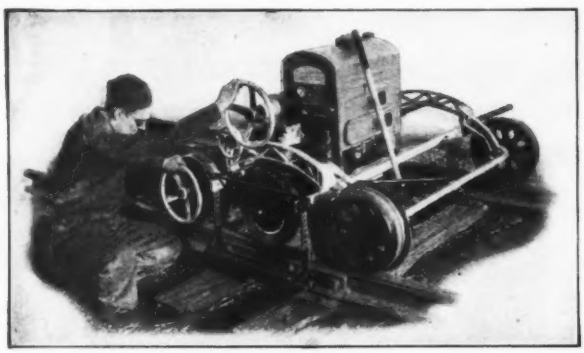

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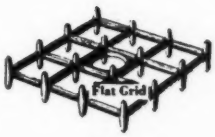

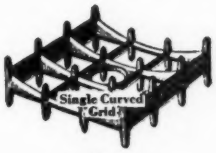

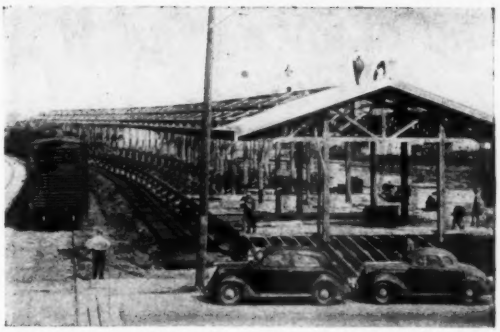

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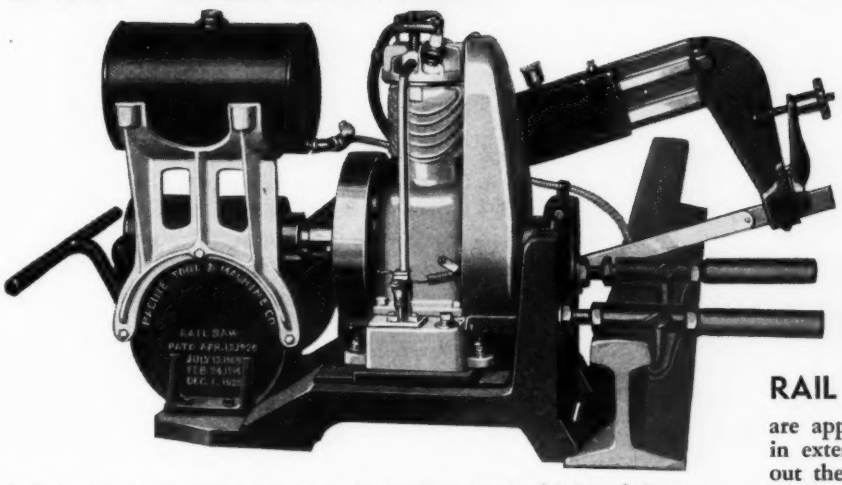

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are approved by rail experts and are in extensive use in railroads throughout the country. Due to the development and production of special heat-treated alloy steel blades, we have been able to effect a marked reduction in cutting time and real saving in the cost of doing this work.

These saws do the work correctly

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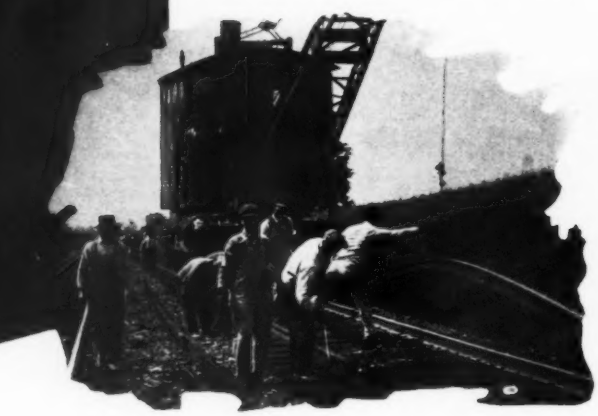

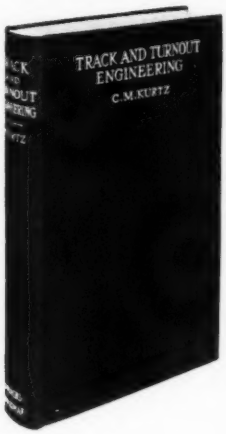

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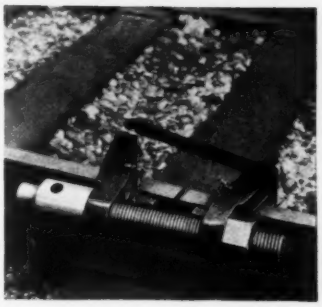

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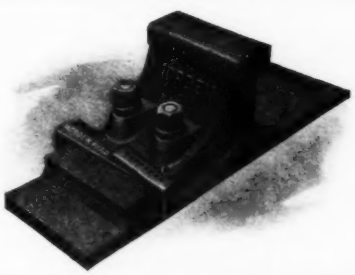

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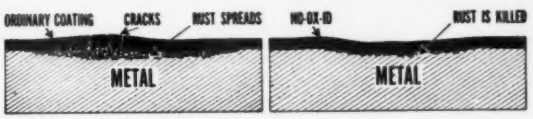

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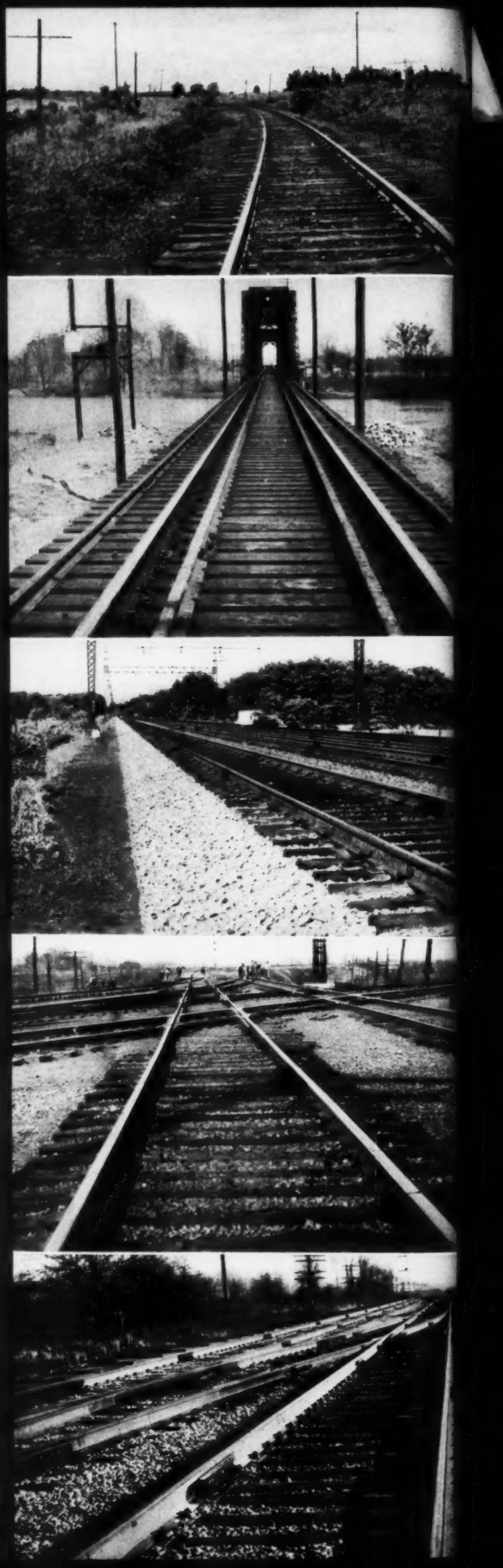
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